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On est instamment prié d'addresser tous les envois et toutes les correspondances destinées aux "Annotationes" à Dr. SEITARO GOTO, RÉDACTEUR, PREMIÈRE ECOLE SUPÉRIEURE, TOKIO.

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A Summary of Japanese Cicadidæ with Description of a New Species.

By **M. Matsumura.**

Entomological Laboratory, Agricultural College, Sapporo.

With Pl. I.

Japan is very rich in insect life. Cicadidæ, as well as many others of the hexapod tribe, are found here, and the following sixteen species are well known in this Empire. The species peculiar to Japan are marked with a star.

1. *Platypleura repanda*, Fabr.
2. **Grapsaltria colorata*, Stål.
3. **Cosmopsaltria opalifera*, Walk.
4. *Pomponia maculaticollis*, Motsch.
5. **Pomponia japonensis*, Dist.
6. *Leptosaltria tuberosa*, Sign.
7. **Terpnosia Pryeri*, Dist.
8. **Terpnosia nigrocosta*, Motsch.
9. *Cryptotympana fascialis*, Walk.
10. *Cryptotympana pustulata*, Fabr.
11. **Cicada flammata*, Dist.
12. **Cicada bihammata*, Motsch.
13. *Cicada clara*, Motsch.
14. *Cicada vacua*, Oliv.
15. **Melampsaltria radiator*, Uhler.
16. **Melampsaltria yezoensis*, sp. nov.

Of about 330 species of the described Cicadidæ in the world, fifteen are known to occur in Japan; but owing to insufficient descriptions I am very doubtful whether nos. 13 and 14 are not merely synonymic names or altogether different species. Of the sixteen species mentioned above nos. 6, 7, 8, 10, and 15 are confined to the Main Island; and the genus *Graptosaltria* is peculiar to Japan.

1. *Platypleura Kæmpferi* (fig. 1, a, b).

Teltigonia Kæmpferi, Fabricius. Ent. syst. 1794.
Cicada Kæmferi, Walk. List Hom. 1850.
Platypleura Kæmpferi, Butl. Cist. Ent. 1874.
Platypleura hyalino-limbata, Sign. Bull. Soc. Ent. Fr. 1881.
Platypleura fuscangulis, Butl. Cist. Ent. 1874.

This is a very common insect in Japan and is known as *ni-ni zemi*. Its description given by Mr. L. DISTANT in his Monograph of Oriental Cicadidæ is as follows:—

"Head, pronotum, and mesonotum dull ochraceous; head with the following black markings:—a narrow transverse fascia on front, a transverse fascia between eyes, forming a spot at area of ocelli, continued on inner margin of eyes, two small discal spots, and a fasciate spot anteriorly and posteriorly, the oblique furrows and the lateral dilated margins black; mesonotum with 4 obconical spots on anterior margin (the central ones shortest), a lanceolate discal spot much widened posteriorly and a spot in front of each anterior angle of the basal cruciform elevation, black. Abdomen black, the tympanal coverings and posterior segmental margins dull ochraceous, head beneath, sternum, and legs dull ochraceous; central sulcation and posterior margins to face; a fascia between eyes and face, some obscure sternal spots, and a spot at base of operculum, black; abdomen beneath blackish, with the posterior segmental margins ochraceous. Tegmina with about the basal half opaque and creamy ochraceous, costal membrane with two fuscous spots, and the following fuscous fasciæ:—one basal, one oblique, passing through centre of radial area and terminating at

apex of lower ulnar area, and a broad, waved, and irregular fascia commencing at apex of radial area and united with the preceeding fascia at apex of lower ulnar area; between the second and third fasciæ are some small fuscous spots and a semihyaline spot near end of radial area, and a similar spot in lower apical area, remainder of tegmina hyaline, with a broad subapical fuscous fascia extending to apex of third ulnar area, an apical fuscous spot and some irregular small fuscous spots on the apices of longitudinal veins to apical areas. Wings dark fuscous, overlapping at centre, outwardly convex, but somewhat oblique at their lateral margins; the face is considerably compressed with the central sulcation broad and somewhat deep."

Long. excl. tegm. 21–22 mm. Exp. tegm. 65–73 mm.

Hab.—China and Japan.

This beautiful insect is found all over Japan from the Kurile Islands in the north to Ryuku in the south, and from the variegated coloration of its wing is very familar. It comes out early in June and its monotonous *ni-ni* sound is heard until the end of September. Its voice is heard from morn till night, and it always remains in the same place unless disturbed by an enemy. Its pupal covering is easily distinguished from that of other species particularly by some earth always adhering to it. According to L. DISTANT this species is entirely confined to Japan and China. I sent a specimen of this insect some years ago to Mr. L. O. HOWARD, entomologist to the Agricultural Department of the United States and by his kindness it was handed on to Prof. UHLER, president of the Maryland Academy of Sciences. It was by him identified as *Platypleura repanda*, Linn. of Europe and Asia (fig, 2, a, b). Ninteen specimens of this insect sent to the Columbian Exposition by Mr. NAWA, under the name of Prof. MITSUKURI, have also been identified as *P. repanda*, L. It is doubtful whether it is after all the real *repanda*, because the Japanese insect is not only smaller in size but also, according to the description and figures given by Mr. DISTANT in his classic work, it differs much in its marking. However I have placed this species on the plate for reference.

2. *Graptosaltria colorata* (fig. 3, a, b).

Graptosaltria colorata, Stål. Berlin. Ent. Zeit. 1865.

This species is peculiar to Japan, and the only known representative of the genus. It is very common on the Main Island and in Ryukyu, but much less so in Hokkaido. It is commonly known as *aburazemi*. Its description is as follows :—

"Head black ; apex and base of front, anterior lateral margins, a small spot behind eyes, and two large discal spots to vertex castaneous ; ocelli and eyes ochraceous. Pronotum castaneous, the anterior and posterior margins, and two narrow central longitudinal fasciæ, blackish ; extreme lateral margins castaneous. Mesonotum black, with 2 faint obconical spots at centre of anterior margin ; in some specimens there are a few castaneous spots ; cruciform elevation castaneous, with its centre and apical angles black. Abdomen above black. Body beneath ochraceous, mottled with dark castaneous and blackish ; opercula dull ochraceous, the outer margin and a subapical fascia castaneous, a small pale spot near apex of lower apical area."

Long. excl. tegm. 30–37 mm. Exp. tegm. 92–118 mm.

The females of this species are invariably larger than the males, just contrary to what is known in the other species ; and on examination each contains, according to Mr. Nawa, on the average 349 long, slightly curved eggs. It cries from morn till night, but chiefly towards evening at sunset. It continually changes its place ; sometimes resting upon the telegraph-pole ; sometimes on the fence and at others on bamboos, etc. This, like the preceeding species, is very common and is easily distinguished by its reddish brown wings.

3. *Cosmopsaltria opalifera* (fig. 4, a, b).

Dundubia opalifera, Walker. List Hom. 1850.
Cosmopsaltria opalifera, Dist. Monog. Orient. Cicad. 1890.

This small species is also peculiar to Japan, and is commonly known

as *tsukutsukubōshi*. Its ground color is black, while the yellowish green markings differ very much according to individuals. Its description is as follows :—

" Head and thorax above ochraceous ; head with its lateral striations and a spot near base of front, the area of the ocelli, and a large irregular lateral fascia in front of eyes, black ; pronotum with two central black fasciæ somewhat hour-glass shaped, the furrows, a spot near each lateral angle of posterior margin, and the extreme lateral margin, black ; mesonotum with five large black fasciate spots, of which two are obconical with their bases on the anterior margin, one large central and subtriangular, and one somewhat broken occupying each lateral area ; abdomen above blackish, the tympanal coverings ochraceous. Head beneath sternum, legs, and opercula ochraceous ; apices of anterior femora, the apices of the tibiæ and tarsi, the transverse striations and longitudinal sulcation to face, and the margins of the opercula black ; abdomen beneath castaneous, apex pitchy.

" Tegmina and wings pale hyaline, the venation brownish ; tegmina with the costal membrane brownish-ochraceous, the transverse veins at the bases of the second and third apical areas fuscated. The opercula are short, narrowed and angulated at apices, and reach the third abdominal segment.

" Long. excl. tegm. ♂ 30 mm. Exp. tegm. 82 mm."

It comes out in late summer or early autumn, and for this reason the Chinese call it " winter cicada," it being the forerunner of winter. It is very hard to catch on account of its agility, but at the time of oviposition it seems to become very sluggish. Its screamings are heard at first far up on high trees or in mountain regions, but gradually it comes down, and abounds near human habitations and so becomes familiar to all.

In Hokkaido specimens are much smaller and the species is here more local, it specially prefering regions where willows abound, the latter being probably its food plant.

4. *Pomponia maculaticollis* (fig. 5, a, b).

Cicada maculaticollis, Motschulsky. Bull. Soc. Nat. Mosc. 1866.

Pomponia Maculaticollis, Dist. Monog. Orient. Cicad. 1891.

This is an alpine insect, but in Tokyo it is often found near houses and is as familiar as the former species. It is commonly known as *mimmin zemi*, deriving its name from the tone of its cry. It is generally distributed throughout Japan, and is also common in China, where it presents a slight variation in color. Description as follows:—

"Head, pronotum, and mesonotum greenish-ochraceous. Head with the transverse striæ to front, the area of the ocelli, a larger spot at inner margins of eyes, posterior margins of eyes, and a transverse linear spot at anterior angles of vertex, black. Pronotum with two central linear fasciæ, sinuated and ampliated anteriorly and posteriorly, a discal spot on each side, the furrows, two transverse spots on outer margin, and the extreme lateral and posterior margins, black. Mesonotum with two central obconical spots, followed by some irregular markings on each side of disk, a small rounded spot at anterior angles of basal cruciform elevation and two central lines on disk of same, black. Body beneath and legs greenish ochraceous; transverse striæ to face, inner area of eyes, central line to and apex of rostrum, femoral streaks, bases and apices of tibiæ, outer and posterior margins of opercula, and basal halves of abdominal segments, black.

"The opercula are broad, convex and overlapping; the face has a faint central longitudinal sulcation, and the rostrum extends to the posterior coxæ.

"Long. excl. tegm. 40–43 mm. Exp. tegm. 120–123 mm."

Hab.—Japan and China.

It is very common in August, coming out quite late among cicadas, and like the preceding species is somewhat difficult to catch.

5. *Pomponia japonensis* (fig. 6, a, b).

Pomponia japonensis, Distant. Monog. Orient. Cicad. 1892.

This species very much resembles *Pomponia fusca*, Olivier of

continental India, only differing in the opercula being widely divided and not meeting at the inner side, and also by the rostrum only reaching the posterior coxæ, while in the species of Olivier it extends to the basal segment of the abdomen. Its description is as follows :—

" Head, pronotum, and mesonotum greenish-ochraceous. Head with the anterior margins of front, an irregular central fascia to vertex enclosing the ocelli, a large spot on inner side of eyes, and the anterior lateral angle of vertex, dark olivaceous. Pronotum with a broad central longitudinal fascia, two large oblique spots on each lateral area, and a spot on the lateral margin, brownish olivaceous, mesonotum with seven brownish-olivaceous spots ; two sinuate central ones, and a long spot on each lateral area, two small spots of the same color in front of each anterior angle of the basal cruciform elevation. Abdomen pale castaneous with ochraceous pilosity. Head beneath, sternum, legs and opercula pale greenish ; upper and apical areas of face, a spot near apices of femora, apices of anterior and intermediate tarsi, apex of rostrum and a triangular spot between the intermediate and posterior coxæ, dark fuscous. Abdomen beneath dark ochraceous.

" Tegmina and wings pale hyaline; tegmina with the costal membrane greenish, transverse veins at the bases of the second, third, fourth, fifth, seventh and eighth apical areas infuscated, and a marginal series of small fuscous spots situated at the apices of the longitudinal veins to apical areas ; the venation is otherwise ochraceous, sometimes replaced by black ; basal cell and claval margin brownish-ochraceous. Wing with the venation brownish-ochraceous ; claval margin darker in hue.

" Long. excl. tegm. ♂ 36 mm. Exp. tegm. 88–92 mm."

This beautiful species is also peculiar to Japan and is known commonly as *higurashi* or *kanakana zemi* ; the latter name being derived from its screamings. It is an alpine insect, many living in deep forests where sunlight does not penetrate. Its voice is heard especially at sunrise and sunset. In Hokkaido it is very common near dwellings and is the earliest cicada we meet with. It cries from morn till night with its peculiarly accented tone.

6. *Leptosaltria tuberosa* (fig. 7, a, b).

Cicada tuberosa, Signoret. Ann. Soc. Ent. Fr. 1847.
Dundubia tuberosa, Walk. List Hom. 1850.
Leptosaltria tuberosa, Stål. Berl. Ent. Zeit. 1866.

This is a somewhat rare insect resembling the *haruzemi* in its general features, but differs from it in the smallness of its head, the lateral margins of the pronotum being distinctly toothed, and the second and third ventral segments in the male being furnished with distinct, lateral tubercules. Description as follows :—

" Body above brownish ochraceous ; head with some lateral curved fasciæ to front, some oblique fasciæ to vertex, area of ocelli and basal margin blackish ; pronotum with two central blackish longitudinal lines, the anterior margin, the edge of lateral margin, and a spot near each lateral area blackish, posterior margin greenish or ochraceous ; mesonotum with the following blackish markings :—a narrow central longitudinal fascia, on each side of which is a short curved fascia; these are followed by a short triangular spot in front of the basal cruciform elevation, and a fascia on each lateral margin uniting with the preceding fascia at base. Abdomen with the segmental margins blackish.

" Tegmina and wings pale hyaline, the venation brownish; tegmina with the costal membrane brownish, a blackish spot at base of upper ulnar area, the transverse veins at the bases of second, third, fifth and seventh apical areas infuscated, and a submarginal series of small fuscous spots placed near the apices of the longitudinal veins to apical areas.

" Opercula small, situated wide apart, their apices broadly convex.

" Long. excl. tegm. ♂ 27–32 mm. Exp. tegm. 72–79 mm."

This is quite a widely distributed species known also in continental India, Java, and other places. I have never seen it in this Empire and only know of its existence here from figure and description. I am not able therefore to describe its character.

7. *Terpnosia Pryeri* (fig. 8, a, b).

Terpnosia Pryeri, Distant. Monog. Orient. Cicad. 1892.

"♂. Head black, thickly greyishly pilose with two ochraceous spots on posterior margin. Pronotum ochraceous, thickly pilose with two central longitudinal fasciæ, a curved linear spot on each side of disk, the fissures and the inner lateral and posterior margins black; a fuscous spot on lateral margins at posterior angles, and a small central black spot on posterior margin. Mesonotum dark ochraceous, with four obconical black spots,—the central pair shortest—a central lanceolate black spot extending from the cruciform elevation to near anterior margin, and a very small spot on anterior margin between the outer obconical spots. Abdomen pale castaneous, the posterior segmental margins—widest at centre—black. Body beneath ochraceous, thickly pilose; striations to face and sometimes fascial disk, apices and sometimes under surface of femora, bases of tibiæ, apices of tarsi, sternal spot and extreme base of abdomen, black.

"Tegmina and wings pale hyaline, the venation ochraceous or fuscous; tegmina with the costal membrane ochraceous; the transverse veins at the bases of the second, third, fifth and seventh apical areas infuscated.

"The rostrum reaches the posterior coxæ; the face is obscurely sulcate and striate.

"Long. excl. tegm. ♂ 27 mm.; ♀ 22 mm. Exp. tegm. ♂ 67 mm.; ♀ 64 mm."

This is also a species peculiar to Japan and appears to be quite local in its occurrence, not being found in the southern provinces. It is commonly known as *haruzemi* or *matsumushi*; the former name on account of its early appearance, and the latter on account of its always living on pine trees. Its coloration much resembles pine bark, and its cry is often heard near dwellings, but it is very difficult to see. It comes out in spring and its nearly monotonous sound of *jiwa-jiwa* may be heard from a good distance off.

8. *Terpnosia nigrocosta* (fig. 9, a, b).

Cicada nigrocosta, Motschulsky. Bull. Soc. Nat. Mosc. 1866.
Terpnosia nigrocosta, Distant. Monog. Orient. Cicad. 1892.

"♂. Head ochraceous, marginal striations to front and the whole of vertex—excluding two small spots near eyes and two basal spots—black. Pronotum blackish; the lateral and posterior margins, a central longitudinal fascia, and some discal macular markings, ochraceous; extreme edges of posterior and lateral margins, with three marginal spots near each lateral angle and a central basal marginal spot black. Mesonotum ochraceous with a large central fused spot, an irregular fascia on each lateral area, and a large spot in front of the basal cruciform elevation, black. Abdomen pale castaneous, with greyish tomentose lateral markings, the base,—narrowly—the apical segment and areal appendage, and a lateral series of segmental spots, blackish. Body beneath ochraceous; a central fascia and transverse striations to face, sternal spots, opercula, femora, anterior tibiæ, base of posterior tibiæ, base and apex of anterior and intermediate tarsi, and margins of the apical segment, black or blackish.

"Tegmina and wings pale hyaline, the venation mostly fuscous; tegmina with the costal membrane ochraceous, its outer edge black; the transverse veins at the bases of the second, third, fifth, seventh and eighth apical areas infuscated, a series of small marginal spots on the longitudinal veins to apical areas, a spot on venation at base of upper ulnar area and the same at apex and anterior margin of basal cell, and a claval streak, black.

"The rostrum reaches the posterior coxæ; the face is very obscurely sulcated and somewhat strongly transversely striate.

"Long. excl. tegm. ♂ 30–31 mm.; ♀ 23–26 mm. Exp. tegm. ♂ 77–80 mm.; ♀ 72–88 mm."

This very much resembles the preceding species, differing only by its larger size, its color and the shape (best explained by figure) of its opercula, the fasciated abdomen and the relative length of the first and second apical areas to tympana, the first in *T. Pryeri* being about twice as long as the second. It is also peculiar to Japan. It is recorded that Mr. Lewis, the celebrated coleopterist, first procured a good series of the specimens of this species during his entomological journey in Japan. It has

been taken at Chuzenji, Nikko, and therefore seems to be quite an alpine insect. I think *nikkōharuzemi* is the proper name for it.

9. *Cryptotympana fascialis* (fig. 10, a, b).

Cicada fascialis, Walker. List Homop., Suppl. 1858.
Cryptotympana fascialis, Stål. Öfv. Vet.-Ak. Förn. 1862.
Fidicina nigrofuscata, Motsch. Bull. Soc. Nat. Mosc. 1866.

"♂. Body above black, sparingly and finely pilose; tympana castaneous, basal abdominal segment narrowly margined with greyish-white pile, especially at the lateral margins; eyes dull obscure ochraceous. Body beneath thickly clothed with greyish-white pile; head, prosternum, lateral margins and a broad central fascia to abdomen, dull olivaceous; anterior and intermediate legs dull olivaceous streaked with ochraceous, posterior legs ochraceous, femoral streaks and apices of tibiæ olivaceous, opercula bright ochraceous; face with a central longitudical fascia and the margins of head between face and eyes dull ochraceous.

"Tegmina and wings hyaline, the venation olivaceous and fuscous; tegmina with the costal membrane olivaceous, the costal area blackish; transverse veins at the bases of the second and third apical areas slightly infuscated; base of tegmina not extending beyond basal cell (excluding venation) blackish; vein beneath, lower ulnar area reddish ochraceous; wings with less than basal half blackish.

"The opercula are about half the length of the body, subovate, overlapping at their central basal margin, and their apices broadly and convex rounded.

"Long. excl. tegm. ♂ 45–49 mm. Exp. tegm. 120–125 mm."

This is the largest cicada existing in this Empire, and though common in Okinawa, is not found in the north. I have no information about its character, but should like to hear about it from any one who has travelled in that region. I am only acquainted with its figure and description as given by DISTANT, and it is said that PRYER has collected it in Ryuku. This species is also found in Siam and China.

10. *Cryptotympana pustulata* (fig. 11, a, b).

Tettigonia pustulata, Fabr. Mant. Ins. 1787.
Tettigonia atrata, Fabr. Mant. Ins. 1787.
Cicada atrata, Oliv. Enc. Meth. 1790.
Cicada nigra, Oliv. Enc. Meth. 1790.
Cicada pustulata, Oliv. Enc. Meth. 1790.
Cicada atrata, Sign. Rev. and Mag. Zool. 1849.
Fidicina atrata, Walk. List. Hom. 1850
Fidicina bubo, Walk. List. Hom. 1850.
Cryptotympana bubo, Stål. Öfv. Vet.-Ak. Förn. 1872.
Cryptotympana atrata, Stål. Ann. Soc. Ent. Fr. 1861.
Cryptotympana nigra, Stål. Hemp. Fabr. 1869.

"♂. Body above black; eyes ochraceous; mesonotum with obscure central linear pale castaneous obconical spots, the cruciform elevation also castaneous. Body beneath black; head with the central sulcation, apex and lateral margins of face, the outer and posterior margins of opercula, margins of abdominal segments, and some scattered sternal spots, ochraceous. Legs ochraceous, femoral streaks and bases and apices of tibiæ black.

"Tegmina and wings pale hyaline, the venation ochraceous and fuscous, tegmina with the costal membrane ochraceous, its extreme basal costal edge black, the post-costal area black; less than basal third of tegmina (excluding venation) black; basal cell black, with an ochraceous spot. Wings with less than basal half black. Body robust, but moderately elongate; opercula not half the length of the body, their outer margins oblique and slightly convex, their inner margins strongly oblique to apices, which are broadly and obtusely angulated.

"Long. excl. tegm. ♂ 44 mm. Exp. tegm. 125 mm."

This large insect seems to be quite a tropical form, being found also in the Malay Archipelago, Philippine Islands, Hongkong, and China; in south Japan it is very common, but is not found in Hokkaido and the northern parts of the Main Island. It cries only in the morning, but not in the afternoon, making clamorous and deafening noise somewhat resembling the sound of *sha-sha*. Like the preceding species, it is easily distinguished from any other by its opercula being bright yellow. Mr. Nawa found that it deposits its eggs in the half dead branches of

mulberry-trees, and though I have not yet found their eggs, it seems to me that willow is the food plant in the south. It is commonly known as *kumazemi*.

11. *Cicada flammata* (fig. 12, a, b).

Cicada flammata, Distant. Monog. Orient. Cicad. 1882.

"♀. Head, mesonotum and abdomen black, the pronotum reddish-ochraceous. Head with a spot at base and apex of front, a spot at anterior angles of vertex and a spot behind eyes reddish-ochraceous; eyes ochraceous. Pronotum with two slender central black fasciæ, narrowed, angulated and joined posteriorly; inner edge of lateral and posterior margins, outer edge of posterior margin and edge at lateral angles, black. Mesonotum with two central obconical spots, the margins of which are reddish ochraceous; the cruciform elevation (excepting centre and angular apices) also reddish-ochraceous. Abdomen with faint traces of a double longitudinal series of white pilose spots. Body beneath dark castaneous, the sternum thickly clothed with greyish-white pile; space between eyes and face black, enclosing an ochraceous spot on anterior margin; legs ochraceous.

"Tegmina and wings hyaline, the venation ochraceous and fuscous. Tegmina with the base—not extending beyond basal cell—ochraceous, a black linear streak extending about inner edge of costal membrane which is ochraceous; transverse veins at the bases of the second and third apical areas, and sometimes the interior of the upper apical area, infuscated; wings with the base narrowly ochraceous, and with an inner and an outer claval ochraceous streak.

"Long. excl. tegm. ♀ 40 mm. Exp. tegm. 120 mm."

This is a common insect in Hokkaido and is often found near houses. It comes out late in summer, especially in the month of August and September, a little earlier than *tsukutsuku bōshi* (*Cosmopsaltria opalifera*). Its cry is heard from morning till night, especially during the hottest part of the day, producing a noisy peculiar *ghi ghi* sound, causing the listener

at a distance to feel somewhat sleepy. It chiefly prefers oak trees. I have not yet found this insect in other parts of Japan; it is probably peculiar to Hokkaido. For this reason it is known as *Yezozemi*.

12. *Cicada bihammata* (fig. 13 a, b).

Cicada bihamata, Motsch. Etud. Ent. 1861.

"♂. Head black; a spot at base of front, the anterior marginal angles of vertex, and a spot a little before posterior margin of eyes, ochraceous; ocelli and eyes dull ochraceous. Pronotum castaneous, its margin ochraceous; a central black fascia containing a lanceolate ochraceous spot and with a wide basal spot of the some color; lateral margins inwardly and posterior margin inwardly and outwardly black, the posterior marginal angle and an oblique spot just before it also black. Mesonotum black, with two discal angulated ochraceous fasciæ united at anterior margin; the lateral margins and the lateral sides and angles of the basal cruciform elevation ochraceous. Abdomen above blackish castaneous; apical segments centrally marked with ochraceous. Body beneath blackish, a spot on anterior margin of face, a marginal spot between face and eyes, lateral margins of the prosternum, legs, opercula and segmental margins ochraceous; legs with blackish markings.

"Tegmina and wings pale hyaline. Tegmina with the venation ochraceous and fuscous; basal cell almost—sometimes partly—black; transverse veins at the bases of the second, third, fourth, fifth and seventh apical areas infuscated; base of claval area ochraceous.

"The opercula about half, or a little more than half, the length of the abdomen, are divergent, with their apices broad, and convexly rounded, their outer margins concavely sinuate and black at outer basal margin.

"Long. excl. tegm. ♂ 33 mm. Exp. tegm. 88 mm."

This very much resembles the preceding species, but differs from it in its small size, its being a little paler, and the date of appearance

being much earlier in summer. Its cry also resembles that of the preceding species though it is not so loud. It frequents trees near houses and is very common in Hokkaido. According to PRYER and LEWIS this species is also found in Tokyo, but I have never come across it. I sent this insect to America for identification a few years ago, and it has been identified as *Cicada Lecchi*, Distant, and is said to be found also in China. But according to the description and figures given by DISTANT it differs very much from that species, especially in the form of the opercula and the abdomen not being ornamented with longitudinal series of whitish pilose spots.

13. *Cicada clara.*

Cicada clara, Motsch., Bull. Soc. Nat. Mosc. 1886.

I have not yet seen this insect, and owing to lack of good description, it is not known whether it is merely a synonym or quite a new form. The following description is given by Motschulsky.

"Statura et color cicada orni sed thrace dorso magis nigro. Elongata attenuata opaca, fusco-testaceo, capite thoraceque nigris, subtestaceo pictis, hoc lateribus viridi maculatis, pectore atro, pedibus nigris testaceo annulatis; ♂, abdominis segmento, penultimo subtus trapezoidale, ultimo attenuato, tympanis transversis femoribus anticis bidentatis.

"♂, Long. corp. 12¼ l.; lat. Exp. alar. 31 l.

Hab. Japan."

14. *Cicada vacua.*

Cicada vacua, Olivier, Enc. Meth. 1790.

This also has not yet been identified. The following description is given by Olivier:—

"La cigale vuide.

"La tête, le corps et les pattes sont noir minime ou de couleur fauve; l'abdomen est vuide et comme transparent, son dernier anneau

est garni de duvet blanc; les etuis et les ailes sont transparens comme du verre.

Hab.—"Elle vient du Japon".

15. *Melampsaltria radiator* (fig. 14, a, b).

Melampsalta radiator, Uhler. Proc. U. S. Nat. Mus. 1896.

Mr. P. Uhler's description of this species is as follows:—

"Form of *Cicada montata*, Hagen, but a little broader, more generally covered with silvery whitish scales, which easily rub off and with the apical valvular ventral segment of the male short, ovate, not tapering at tip, and with the opercula longer, forming curved lobes which approach but do not touch on the middle line of venter. General surface black, polished, with the venter pale fulvous. Vertex a little broader than long, with the apex and base each with a yellowish spot, the latter being placed in an oval cavity, the supra-antennal lobes narrow, testaceous, front moderately blunt, broadly margined with yellow, sulcate on the middle line above, and over this is a large yellow spot, the transverse carinate lines and grooves distinct, rostrum black, reaching to the middle coxæ. Legs greenish, with the base and apex of femora and some lines along their surface, knee tips, and sometimes the middle of tibiæ, base and tip of tarsi, besides the nails, and the three spines of anterior femora, black, the inner spine much longer than the others. Pronotum bordered behind and on the sides with greenish yellow, mesonotum with a deltoid yellow spot each side of disk, connecting with a slender line which continues back to the borders of the cross, and from thence on the posterior and lateral carinate borders. Wing covers with large and often irregular meshes, the apical series beginning with a moderately short trangular one, and followed by longer curved ones to the inner bend of the margin, the costal vein greenish yellow, veins dark brown, yellow basally, and including the membrane, wings with brown veins, the inner area striped and margined with smoke brown, the basal membrane reddish, a streak (margined with fuliginous)

running out from it, pale plumbeous. The inner alulet is large, ovate, bounded by a course vein and traversed by numerous long veins. Abdomen long and narrow with the middle of venter striped with a series of black spots.

"Length to tip of abdomen: ♂ 20 mm.; ♀ 22 mm. Spread of wing-covers, 55–57 mm.

"The female has a much longer and more slender spur at apex of the tergum than in the male. In this species the two ulnar veins are separated at their origin on the angle of the basal areole, and the inner alulet (*Schlussfeld*) of the wing is broadly rounded and traversed by eight or more very slender veins, forming long areoles."

This is the smallest cicada found in Japan, and it is not only rare but also very hard to collect, being found always on the stems of pine trees which naturally protects it. Its cry very much resembles that of a certain locust (*Xiphidium*), producing a monotonous *chitch-chitchi* sound, by which its presence is betrayed. It comes out in July and its voice is heard to the end of October. It is truly an alpine insect being always found in the mountain forests of the north.

16. *Melampsaltria yezoensis*, sp. nov.

Closely allied to *M. radiator*. Head and thorax above black, sparingly covered with short yellowish metallic pilosity, sternum with silvery short hairs. Basal joint of rostrum yellow; eyes dusky with pale portion; legs testaceous with the following black markings:—fascia of coxa, one or two spots of trochanter, two longitudinal fasciæ and tip of femora, tip and longitudinal fascia of tibiæ, inner side of tarsi and tip of claws, and the three spines of anterior femora. Sternum pale yellow with some black markings, operculæ pale yellow with the base black, anterior and posterior margin of pronotum brownish yellow, the sides pale yellow, a deltoid spot on each side of disk and sides of mesonotum yellow, the former not continued with a slender line which extends back to the borders of the cruciform elevation. Abdomen black with

smooth metallic yellow pilosity, posterior margin of each segment deep yellow. Apical areas of wing covers (tegmina) beginning with a sub-lanceolate one, two veins of second apical area being separated at their origin on the angle of first ulnar area, two veins of fourth ulnar area not separated at their origin, arising from common stalk on the basal cell. Costal, basal and ulnar veins olivaceous, anal vein and apical margin dusky, basal membrane beautiful cinnabar red. Wings, in certain angles of reflection, beautiful purplish blue. The rest same as the former species.

Long. excl. tegm. 26–27 mm. Exp. tegm. 67–69 mm.

Var.? A broad greenish yellow central fascia passes across the pronotum, widened anteriorly to clavate form, posteriorly to equilateral triangular form, bordered by a broad transverse greenish yellow fascia at the posterior margin. Greenish yellow deltoid spot on each side of mesonotum large, just like an inverted M, not continued to the cruciform elevation; the latter being dull yellow and traversed by a central brownish fascia. The common stalk of fourth ulnar vein on the angle of basal cell not so long as in true *yezoensis*. General surface of the body brownish black, sternum, venter, legs much paler than the typical form. Probably this may be quite a different species, but as I have caught only a single specimen, I could not determine fully.

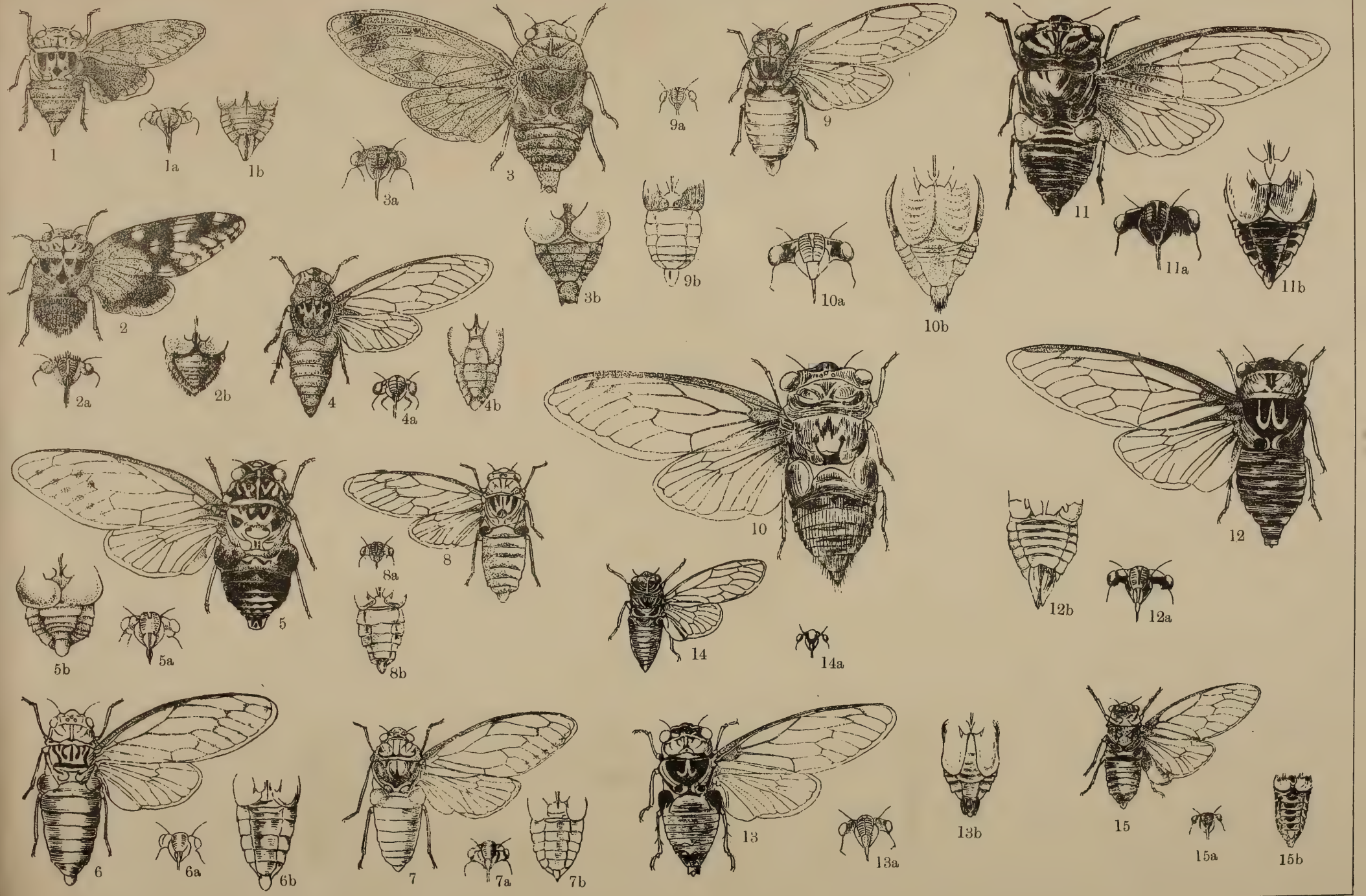
This is closely allied to the preceding species, but is much larger in size and differs in its coloration and venation, and can easily be distinguished from it. I found this insect for the first time last summer in Ishiyama in a forest of birch, its presence being betrayed by its voice, which also resembles that of *M. radiator*. This is not so very rare a species, but being of quite a local occurrence has passed unnoticed through the ten years of my entomological collection in this part of this island. I also heard its voice last year in the deep forest of Jozankei, Abuta, Yamanaka, and Toya during a ramble in the latter part of August.

Besides the species above enumerated it seems to me that there are two or more species which are to be found in some parts of Hokkaido, not yet known to entomologists; for I have heard some unfamiliar sounds of cicada somewhere in a deep forest of Jozankei as well as in other parts. Upon opening the stomach of a trout which I caught last year in Chitose River I found a specimen of a very peculiar species of cicada without head and wing; it is perhaps a new species, but can not well be identified.

EXPLANATION OF PLATE I.

1. *Platypleura Kæmpferi*, Fabr.
2. *Platypleura repanda*. L.
3. *Graptosaltria colorata*, Stål.
4. *Cosmopsaltria opalifera*, Walk.
5. *Pomponia maculaticollis*, Mots.
6. *Pomponia japonensis*, Dist.
7. *Leptosaltria tuberosa*, Sign.
8. *Terpnosia Pryeri*, Dist.
9. *Terpnosia nigrocosta*, Mots.
10. *Cryptotympana fascialis*, Walk.
11. *Cryptotympana pustulata*, Fabr.
12. *Cicada flammata*, Dist.
13. *Cicada bihammata*, Mots.
14. *Melampsaltria radiator*, Uhl.
15. *Melampsaltria yezoensis*, sp. nov.

Printed January 24, 1898.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On a New Species of Littoral Oligochæta (Pontodrilus matsushimensis).

By **AKIRA IIZUKA,**

Zoological Institute, Science Coll., Imp. Univ., Tokyo.

With Plate II.

During a short excursion to Matsushima Bay, Province of Rikuzen, last August I collected, among other annelids, an oligochæte referable to the genus *Pontodrilus*, of which only five species* have been recorded from other parts of the world, but as yet none from our coasts. As the species in question presents some remarkable points of difference from any of the known members of the genus, I think it worth while to publish its description.

It is found burrowing in sand, under the half decayed leaves of *Zostera marina*, along the shores of Matsushima Bay, from low tide mark to a certain distance farther up, beyond, as it seems to me, high tide mark. There is no indication of its presence on the surface of the sand, so that it can only be obtained by indiscriminate digging. I myself have obtained only a few specimens, but Mr. B. ONODERA of Shiwogama, a small town on the western side of the bay, has been able to send me a large number of them living in kind compliance with my request.

Most of the specimens before me are sexually mature.

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* (1) *Pontodrilus littoralis*, Grube from the shores of the Mediterranean. (2) *P. bermudensis*, Beddard from Brazil, Bermuda, and Jamaica. (3) *P. hesperidum*, Beddard from Jamaica. (4) *P. insularis*, Rosa from the Aru Islands. (5) *P. phosphoreus* Dugès from North France.

A. Characters of the adult animal.

In the living state, the annelid in question is of a white color with a light pinkish tint; a single dorsal blood vessel is seen through the more or less transparent wall of the body, as a bright red line running antero-posteriorly and giving off lateral branches.

The body (fig. 1) is long and slender, measuring 90–110 mm. in length, by 3–3.5 mm. in breadth. The number of segments varies from 100 to 105 according to individuals. The breadth of the body increases from the first to about the sixth segment, and then remain nearly the same until the seventeenth. The eighteenth segment has a pair of pad-like longitudinal ridges, on which account it is wider than any other segment. From the next succeeding segment (19th) the body tapers gradually towards the last, or anal, segment.

The *præstomium* (fig. 2, pr.) is present, but small, being separated from the first segment or the *peristomium* (fig. 2, per.) by two curved grooves, which converge posteriorly.

The *clitellum* (fig. 2, cl.) is well developed all around the body, occupying segments XII–XVII.

A pair of pad-like longitudinal ridges (figs. 1 & 3, p.) is developed on the ventral side of the eighteenth segment. They hang out on each side somewhat like the pads of a saddle. Its free edge is bent inwards, *i.e.* mediad, so as to overhang the male pores which open on that segment. The genital papilla (figs. 1 & 3, g.p.) occupies the ventral median portion of segments XIX and XX, both of which contribute to its formation. It is elliptical in outline, with the major axis disposed transversely and has a central depression.

The *setæ* are short and simple, arranged in eight series longitudinally, or in four pairs in each segment. The two setæ composing each ventral pair are nearer each other than those of the dorsal pair. From segment XXI posteriorly, each seta is furnished at its side with a shorter accessory one. No penial setæ are found in the neighborhood of the genital apertures.

The dorsal pores are absent.

The dorsal longitudinal blood vessel is single, giving off numerous lateral branches, or ventro-dorsal commissures. The two pairs of the latter, situated in segments XII and XIII are dilated (hearts), and are very conspicuous. A subneural blood-vessel does not exist in the present species.

The septa between the segments V–XIII are much thickened.

In the alimentary tract the calciferous glands are absent. The gizzard is but very feebly developed. The intestine begins in the fourteenth segment.

The *nephridia* are paired and commence in segment XIII. Their pores open in front of the outer of the ventral pair of setæ, and their funnels lie in the segment preceding that which contains the main mass of the organ. In segment XIV, the nephridia serve as oviducts.

The *spermathecæ* (fig. 4, sp.) occur in two pairs, in segments VIII and IX. Each spermatheca has a diverticulum in the same segment.

The *spermathecal pores* (fig. 1, sp.p.) are situated between segments VII/VIII and VIII/IX. They lie in front of and outside the outer of the ventral pair of setæ, surrounded by a conspicuous elevation of the body surface, so that they may easily be recognized at a glance. The elevations just mentioned as well as the two pads in segment XVIII, and also the genital papilla, are not well developed and therefore difficult to find in young specimens of 40 mm. or so in length.

The *ovaries* (fig. 4, o.), present in one pair, lie in segment XIII, and are connected with the peritoneal epithelium on the posterior side of the septum between segments XII and XIII. The ova are of various sizes but even the largest are furnished with little yolk, and they are never of considerable size. I have also observed some detached eggs in the cavity of segment XIII.

The *oviducal pores* (fig. 1, od.p.) open on segment XIV, in front and a little outside, of the inner of the ventral pair of setæ. The funnels of the oviducts are situated in segment XIII.

The *testes* (fig. 4, t.) are present in two pairs, in segments X and XI.

The *sperm-sacs* (fig. 4, sp.s.) likewise in two pairs, are racemose and lie in segments XI and XII. The spermatozoa are in various stages of development. Almost fully developed spermatozoa have also been observed in the body cavity.

The funnels (fig. 4, f.) of the spermducts are, as usual, provided with long cilia and lie in two pairs in segments X and XI. The *vas deferens* (fig. 5, v.d.) runs posteriorly, on each side as far as segment XVIII, where it enters the mass of the *spermiducal gland* (fig. 5, sp. gl. g.) in the neighborhood of the junction of the glandular and muscular portions of the latter, eventually to open into the lumen of the gland (figs. 5 & 6, sp. gl. c.)

There is only one pair of spermiducal glands. They belong to the tubular type (figs. 4 & 5) and occupy segments XVII–XIX, being much convoluted. Each gland consists, as already mentioned, of a glandular and a muscular portion, the latter leading to the exterior. At first, on dissecting the worm, it appeared to me as if the vas deferens opened at the junction of the two portions of the gland; but a close examination of serial sections has shown that this is not the case. The vas deferens is continued without interruption after joining the gland, and runs in the midst of the glandular cells towards the posterior blind end of the gland, tracing in general, the convolutions of the latter. It is at this end that the vas deferens really opens into the lumen of the gland. In other words the spermiducal gland is not a blind diverticulum but a direct continuation of the course, of the vas deferens. The glandular portion passes at the anterior end into the strongly muscular portion. The latter gradually tapers towards, and finally opens externally at, the male pore inside the pad-like ridge on segment XVIII.

The wall of the vas deferens is composed of a single layer of distinctly nucleated cells, and its inner surface is provided with long cilia (fig. 6, c. and w.v.d.) The glandular portion of the spermiducal gland consists of two distinct layers, the inner columnar epithelial layer, and

the outer thicker layer of more granular pear-shaped cells. The lumen is not ciliated. The part of the vas deferens enclosed in the spermiducal gland traverses the outer layer of the wall, so that in sections of the gland there appear two cavities, one that of the spermiducal gland and the other that of the vas deferens.

The ciliated epithelial wall of the vas deferens passes rather abruptly into the inner wall of the gland (fig. 6)

B. Systematic position of the new species.

From the above description, it is evident that this annelid belongs to the family Cryptodrilidæ, as defined by F. E. Beddard in his "Monograph of the Order of Oligochæta." The generic determination however offers some difficulty. The genus to which the present annelid comes very closely in several respects is undoubtedly *Pontodrilus*,* to which I refer it after all. But the one, by no means unimportant descrepancy consists in the fact that that genus has the "vasa deferentia opening at the junction of the glandular and muscular parts," whereas in the present species, the vas deferens distinctly opens into one end of the glandular portion of the spermiducal gland, the other end leading to the male pore,—a condition which obtains in the genera *Moniligaster* and *Ilyodrilus*, which however belong to families quite distinct from *Cryptodrilidæ*. In all other points the present species tallies well with the definition of *Pontodrilus* as given by Beddard. As the exact relation of the vas deferens and the spermiducal gland in *Pontodrilus* has probably never been subjected to careful examination by means of serial sections, the existing statement concerning it may be considered as open

* Beddard's definition of *Pontodrilus* :—

"Slender worms with eight setæ per segment, in pairs, the setæ of the dorsal pair being usually further apart than those of the ventral. No dorsal pores. Clitellum complete XIII–XVII. Male pores XVIII. Spermiducal gland tubular, vasa deferentia opening at junction of glandular and muscular parts. No penial setæ. Spermathecæ in VIII, IX, with single diverticulum. Gizzard absent or rudimentary; no calciferous glands. Nephridia commence in segment XIII or XV. No subneurian blood-vessel."

to doubt. I hold it highly probable that should known species of *Pontodrilus* be subjected to renewed investigations, the same condition as ascertained by me in the Japanese species will be revealed. With this belief I have preferred to refer my specimens to *Pontodrilus* rather than to create a new genus for its reception.

The species is certainly an undescribed one, so that I propose to call it *Pontodrilus matsushimensis*.

In conclusion I wish to offer my thanks to Prof. IJIMA for his kind supervision of my work.

November 23rd, 1897.

EXPLANATION OF PLATE II.

c.	Ciliation in vas deferens.
cl.	Clitellum.
f.	Spermduct funnels.
g.p.	Genital papilla.
m.	Male pore.
n.	Nuclei of the wall of vas deferens.
o.	Ovary.
od.	Oviduct.
od.p.	Oviducal pores.
op.	Opening of vas deferens into the spermiducal gland.
p.	Pad-like ridges.
per.	Peristomium.
pr.	Præstomium.
sp.	Spermathecæ.
sp.gl.	Spermiducal gland.
sp.gl.c.	Cavity of the glandular part of spermiducal gland.
sp.gl.g.	Glandular part of the spermiducal gland.
sp.gl.m.	Muscular part of the same.
sp.p.	Spermathecal pores.
sp.s.	Spermsacs.
t.	Testes.
v.d.	Vas deferens.
w.v.d.	Wall of vas deferens.

Fig. 1. Ventral view of *Pontodrilus matsushimensis*, nov. sp. 2/1.

Fig. 2. Dorsal view of the anterior end. $a_1 \times 1$ Zeiss.

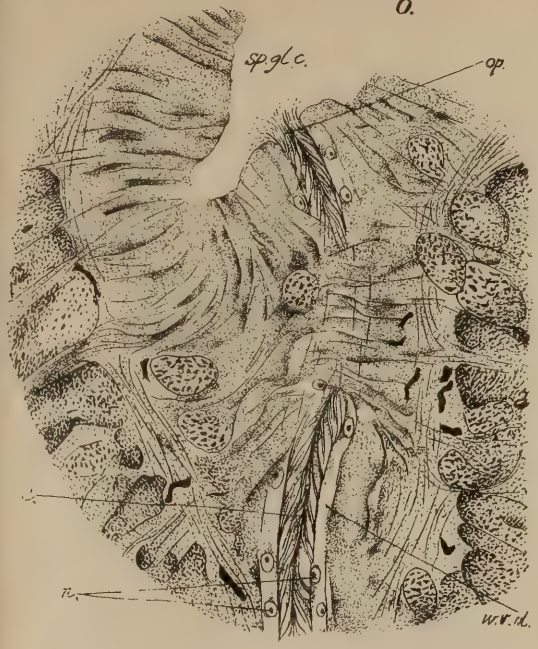
Fig. 3. Ventro-lateral view of the region succeeding the clitellum, showing the pad-like ridges and the genital papilla. $a_1 \times 1$ Zeiss.

Fig. 4. Diagram showing the positions of sexual organs.

Fig. 5. The left spermiducal gland seen from the left side, reconstructed from serial sections. 50/1.

Fig. 6. A section of a spermiducal gland showing the opening of vas deferens into the cavity of the glandular part of the spermiducal gland. $\frac{1}{12}$ hom. $\times$ 2 Zeiss.

Printed January 31, 1897.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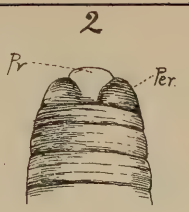
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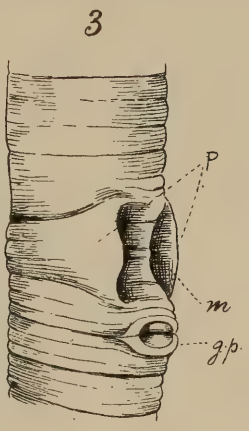
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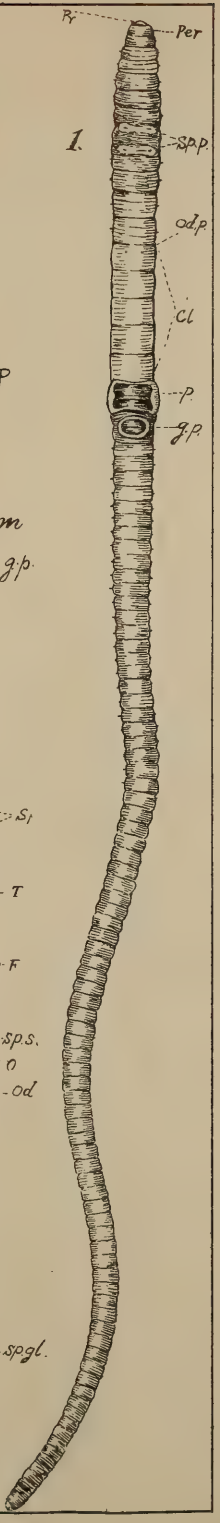
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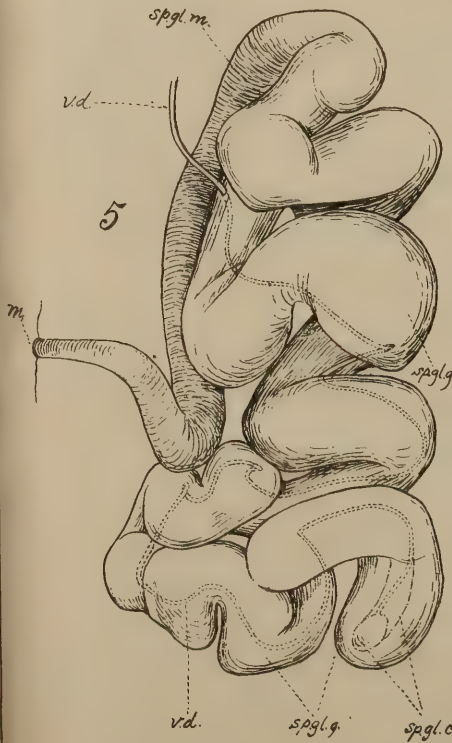
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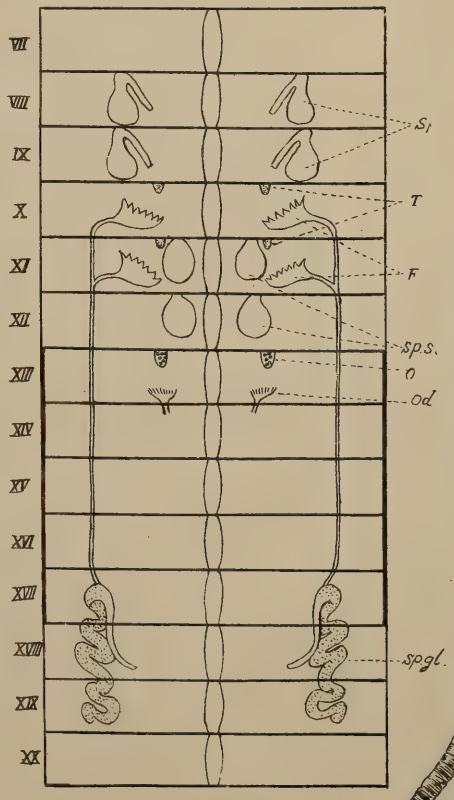
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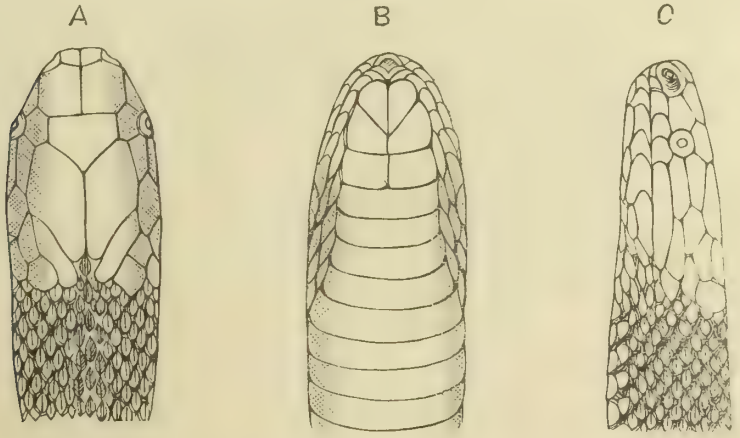
A. Iinuka del.

Ueber eine wenig bekannte einheimische Schlange der Gattung Achalinus (A. spinalis, Peters).

Von **M. Namiye.**

Zoologisches Institut der Kaiserl. Universität zu Tokyo.

Die folgende Beschreibung einer *Achalinus*-Art basirt sich auf zwei Exemplare, welche im vorigen Jahre von meinem Freunde, Herrn Nobumaro Takachiho, in der Nachbarschaft seiner Residenz zu Eihikosan in der Provinz Busen (Kiushiu) gefangen wurden. Der genannte Herr teilt mir mit dass diese Schlange in Kiushiu nur sehr selten vorkommt. Meines Erachtens stellt sie überhaupt eine ganz seltene Species dar, welche bis jetzt nur ein einziges Mal an die Hand eines Herpetologs gelang und deren Fundort auch mit Zweifel als Japan bezeichnet war. In dieser Sachlage wird eine erneute Beschreibung der mir vorliegenden zuverlässigen Materialien nicht ausser Stelle sein wird.



A, Kopf von oben, B, derselbe von unten, C, derselbe von links gesehe

Körper überall cylindrisch ; Kopf schmäler als der Mittelteil des Körpers ; Kopf und Hals ohne deutliche Begrenzung ; Gaumen, Ober- und Unterkiefer mit kleinen Hakenzähnen versehen, die alle von gleicher Länge sind ; kein Giftzahn.

Kopfschilder wie folgt : 1 Frontalschild, 2 Internasalschilder, 2 Praefrontalschilder länger als die Internasalschilder, 2 Supraocularschilder, 2 Parietalschilder, 1 Rostralschild, kein Praeocularschild, 1 Frenalschild verlängert bis zum Auge, 2 Temporalschilder deren Vorderteile von Postocularschild nicht abgesondert sind, 2 Nasalschilder, 6 Supralabialschilder, 6 Sublabialschilder, 6 Inframaxillarschilder.

Schuppenreihen 23. Bauchschilder in einem Exemplar 163, im anderen 166, von denen der eine Analschild etwas länger als der andere ist. Postanalschilder 61 resp. 51 in einziger Reihe.

Kopf und Körper schwärzlich gelbbraun auf der Oberseite ; eine schwärzliche Längsstreifung in der Mittellinie des Rückens vom Hinterkopf bis zu der Schwanzspitze. Der Bauchseite ist gleichmassig gelb, nur in der Mittellinie des Schwanzteils verläuft ein schwarzes unregelmässig markirtes Streif. Ueber die Farbe der Bauchfläche sei noch bemerkt dass sie im Leben heller ist, als bei den in Alkohol conservirten Exemplaren.

Gesammtlänge des einen Exemplars 408 mm., die des andern 405 mm., wovon 87 mm. resp. 75 mm. auf den Schwanz kommen.

Als ich zuerst ein einziges Exemplar dieser Schlange von Herrn TAKACHIHO erhielt, der dasselbe unserem Institut zum Geschenk brachte, wurde seine Bestimmung mir dadurch erschwert, dass sein Frontalschild sich doppelt darstellte, eine Erscheinung die bei den Colubriden als Ausnahme gilt. Da ich jedoch bald zufälligerweise erfuhr dass noch ein zweites Exemplar sich bei Herrn TAKACHIHO befinde, so wendete ich mich an ihn auch dasselbe mir zur Verfügung stehen zu lassen. Dieser Bitte kam er bereitwilligst entgegen, wofür ich hier meinen wärmsten Dank ausspreche. Dieses zweite Exemplar nun zeigte einen einzigen Frontalschild, und so wurde es klar gelegt dass das erste ein in diesem Verhältniss abnormes war—eine Ansicht

die schon vorher von Herrn Dr. Leonhard Stejneger, dem ich das erste Exemplar zeigte, ausgesprochen wurde.

Von den bekannten *Achalinus*-Arten nun giebt es drei, deren synoptische Merkmale im Boulenger' schen "Catalogue" des Britischen Museums folgendermassen angegeben sind:

1. Scales in 25 rows; suture between the internasals longer than that between the præfrontals ..... *rufescens.*
2. Scales in 23 or 25 rows; suture between the internasals shorter than that between the præfrontals ..... *braconnieri.*
3. Scales in 21 rows; Suture between the internasals as long as that between the præfrontals ... *spinalis.*

Von diesen drei Arten kommen unsere Exemplare der dritten am nähesten, einer Art, als deren Fundort "Japan (?)" angegeben ist. Jedoch bieten sie auch Verschiedenheiten dar; so in der Zahl der Schuppenreihen und in der relative Länge der Internasal- und Præfrontalnähte. Was den ersteren Punkt anbetrifft so sei bemerkt dass der Unterschied wohl der individuellen Variation zuzuschreiben ist; der zweite Punkt dagegen scheint von grösserer Bedeutung zu sein. Trotzdem sehe ich mich nicht veranlasst unsere Exemplare von *A. spinalis* specifisch zu trennen, obgleich sie vielleicht auch als eine Unterart derselben vorgestellt werden dürfen.

Abgedruckt 23. Februar, 1898.

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PARTES I et II.

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第二卷第二冊

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Volume I and its parts are no longer sold at the original price, but will be charged for at the same rate as the succeeding volumes and parts (*vide supra*).

ON THE AFFINITY OF OUR WILD AND DOMESTIC SILKWORMS.

By C. SASAKI.

Professor of Entomology, Agricultural College, Imp. Univ., Tokyo.

With Pl. III.

The wild silkworms, which are vulgarly called *Kuwako*, *Kuwaoko*, or *Noraoko*, are widely distributed in almost all parts of our empire, where mulberry trees are planted. They are more or less found on the trees every year, but they do no greater harm than the other lepidopterous larvæ that are found feeding on the same trees.

The eggs of the wild silkworms hatch out usually in the latter part of April, nearly at the same period with our domestic form (*Bombyx mori*, *L.*). From the end of June to July, they, becoming mature, spin a light yellowish cocoon within a folded leaf. The winged insects may appear at the end of two or three weeks after the formation of the cocoon, and lay eggs on branches or twigs of mulberry trees. The eggs hatch out in from two to three weeks after they are laid; but the hatching is sometimes much delayed. Thus the growth of the larvæ becomes very irregular, as we meet with various stages of their growth within the same period, and consequently the winged insects begin to appear in September, and continue to do so till November. The eggs deposited by these on the stems or branches of mulberry trees, pass the winter and hatch out in the following spring.

It seems however that the moth breed generally twice in a year, or even more frequently in a more favorable condition.

On the wild silkworms, Mr. H. Pryer wrote some accounts in his catalogue of the lepidoptera of Japan, in which he says: "*Bombyx sp.* Yokohama; a wild form of the cultivated silkworm. The larva and imago are considerably darker; it spins a much lighter cocoon than the domesticated insects; feeds on the mulberry." This is all that he wrote on the wild silkworm, and he did not in-

stitute a detailed comparison with the cultivated form.

If we now compare the adult of our wild silkworm with *Theophila mandarina*, which Mr. F. MOORE has described in the extract of the Proceedings of the Zoological Society of London, April 1872, we can not find any difference between the two. His description is:—"Female grey: fore wing with a well-defined antemedian curved transverse brown band, and a transverse postmedian suffused brown line, beyond which is a submarginal white-bordered recurved narrow line, outside of which is a suffused brown patch below the apex; discocellular mark indistinct: hind wing brown, with a whitish submarginal line, and two white spots on abdominal margin: thorax brown, waist band grey; antennæ fuliginous, shaft grey."

In the "Bulletin des Soies et des Soieries", 26 September 1885, in T. WARDLE's Handbook of the Collection illustrative of the wild silks of India" and also in "Bolletino Mensile di Bachicoltura" No. 2, 1886, are mentioned some accounts on *Theophila mandarina*, but its specific characters are not described.

In the following lines, I will mention the specific characters of the adult of our wild silkworms as well as its eggs, larvæ, cocoon and pupa in order to compare with those of *Theophila mandarina*, which is said to be commonly found on mulberry trees in China.

If we now compare the adult of our wild silkworm with *Theophila mandarina*, it will be found that both, agreeing in their specific characters, belong undoubtedly to one and the same species.

The adult of our wild silkworms has the following characters:—

Female light brownish grey; fore wing light greyish brown with two not well defined recurved bands, of which the inner (antemedian) is brown, while the outer (postmedian) is much lighter in color. The outer edge of the postmedian band is bordered on its distal edge with a dark brownish line, along its outside runs a white recurved line. A portion of the wing lying just below the apex is slightly indentated, and the latter is bordered with a blackish brown patch. Discocellular mark lying between the two brownish bands indistinct. The principal veins of the fore wing are six; namely costal, subcostal, radial, medial, cubital and anal, all of which arise near the base of the wing (fig 2). Hind wing light brown with its outer half colored dark brown, and in the centre there

runs a broad band lined with blackish rims. The abdominal margin blackish brown with two small white markings. Antennæ brown, pectinated, its teeth are shorter than in the male, and its shaft greyish.

Length of the body 20 mm. Expansion of wings 44 mm. (fig. 1, a).

Male greenish brown, fore and hind wings brownish yellow. The two brownish transverse bands, a discocellular mark and a dark brownish patch bordering the indentation lying below the apex of the fore wing deeper in color and much more distinct than in the female. The indentation deeper, the markings of the hind wing more distinct, and the teeth of pectinated antennæ longer than in the other sex. Length of the body 15 mm. Expansion of wings 39 mm. (fig. 1, b).

The eggs are deposited in groups on the stems or branches of mulberry trees They are oval, somewhat flattened, and of a light yellowish grey color. Their longer and shorter axes are respectively 1.7 mm. and 1.5 mm. The lower surface of eggs i.e. the one by which they are attached to mulberry trees, is flattened, while the centre of the opposite surface is usually more or less depressed.

Larva of the first stage (that is before the first moult) is about 5 mm. in length and has a quite different aspect from that of the following stages (fig. 3).

It has a large blackish head, while the body segments are light blackish. A few segments which follow the head are broader than the latter; but the remaining segments are gradually reduced in size towards the posterior end. The anterior half of the 1st segment of the body is greyish white, and the 2nd, 4th, 6th, 7th and 8th segments are decorated with greyish yellow symmetrical markings. Although the remaining segments bear also similar symmetrical markings, these are more or less indistinct.

On the subdorsal lines of each segment of the body except the 11th, there lies a pair of turbercles provided with a few blackish long hairs bearing short fine prickles; while the 11th bears only a single hair bearing turbercle.

The supra- and infra-stigmatic as well as the basal lines of each segment bear each a single tubercle, which bears also a few long hairs of the same nature as those mentioned above.

After the first moult, the larva becomes naked by losing all its long hairs, and the color as well as the markings are entirely different from those of the previous stage.

After the second stage there are no marked changes in both color and markings till the larva becomes mature.

The mature larva is long cylindrical and 51 mm. in length. The head is comparatively small, somewhat depressed, and light greenish yellow in color. The body is light greenish brown in color, but it looks somewhat dusky, since it is provided with several markings of different kinds, sizes, and colorations (fig. 4).

The principal markings of the body are:—the first body segment deep greenish yellow in its posterior half, the 2nd bears dorsally a large central greenish yellow, and two smaller lateral blackish, patches. The front and lateral sides of the central patch are tinged black. The boundary lines between the central and the two lateral patches as well as the posterior edges of the same segment are tinged crimson red. The 3rd and 4th segments deep greyish brown, and the former is provided with a few deep folds. The body segments from 5th to 10th bear each a * shaped deep greyish markings, which are either somewhat distinct or obscure.

The 5th and 8th body segments bear dorsally a pair of oval patches of a light dull brownish color. Each of the patches on the 5th segment (fig. 4, a) is bordered with an imperfect blackish ring. In the centre of the patch lies a black dot, while the rest of the patch which occupies the larger portion of it, is marked with a few dull purplish elongated areas. The portion of the patch, where the purplish long pieces are wanting, is usually provided with a variable number of white dots. The patch of the 8th segment has a small central dull purplish dot, and the remaining portions are occupied with 3 or 4 short rod-like markings of the same color (fig. 4,b).

The cocoon is elongated oval or rather spindle shaped in form, and of a light yellowish color. The length is about 30 mm. and the breadth 12 mm.

It is usually enclosed in a leaf of the mulberry tree, and hangs on the twigs. The pupa is cylindrical, dark brown, about 20 mm. in length.

The adult of the domestic silkworm (*Bombyx mori*) is mostly white, and larger than that of the wild silkworm. The fore wing is also white; but just below its apex there lies a slight indentation exactly similar to the one found on the fore wing of the wild silkworm moth. The ante- and postmedian bands as well as the discocellular mark, are, in certain individuals, distinctly seen; but a blackish brown patch bordering the indentation below the apex is entirely

absent. The two bands and the discocellular mark above mentioned are colored dull brown (fig. 5, b). In some specimens, each of the ante- and postmedian bands is represented by 2 parallel recurved brownish lines and a discocellular mark is still conspicuous (fig. 5, a). In others, the antemedian band is absent, and only a single recurved light brownish line indicating the inner edge of the postmedian band, and a light brownish discocellular mark are present (fig. 6, a & b). In still others, the recurved line indicating the inner edge of the postmedian band has almost disappeared, while the discocellular mark remains in the form of a faintly colored dot (fig. 7, a & b). Finally even the discocellular mark disappears, and there is no longer found any colored band, patch or dot, and the fore wing looks entirely white (fig. 8, a & b). The venation of the fore wing is exactly similar with that of the adult of the wild silkworm, both being provided with six principal veins—costal, subcostal, radial, medial, cubital, and anal (fig 5, c).

The hind wing is also white, and in its centre runs a light brownish band, which is distinctly seen on the hind wing of the wild silkworm moth (fig. 6, b). In some specimens a part of the band loses its color, while in others the band nearly disappears; but its position is still represented by a single recurved light brownish line, indicating the other edge of the band (fig. 7, b). In still others, there is no longer to be seen even a trace of the band. Further, the abdominal margin of the hind wing is marked with a single blackish dot instead of three which are regularly found on the same region of the hind wing of the wild silkworm moth. In some individuals, the blackish dot becomes very faint while in others it entirely disappears (figs. 5, 6, 7, & 8).

The other characters are exactly same in the moths of both the wild and domestic silkworms

The body of the female is larger than that of the male, and the teeth of its pectinated antennæ are shorter than in the other sex.

The length of the female of our largest race is about 24 mm. and the expansion of wings 46 mm., while that of the male is about 17 mm. and the expansion of wings nearly same as in the female.

The eggs are almost exactly similar in form and size with those of the wild silkworm moth, but they differ in their being purplish blue in the latter (in a race of greenish cocoon they have a greenish shade).

Larva of the first stage about 4 mm. Coloration of the head and body as

well as number and arrangements of tubercles on the segments, are also very similar to those of the wild silkworm; but there are no colored symmetrical markings on the body (fig. 9).

The mature domestic silkworm is long cylindrical, and the length of the body of our largest variety measures about 65 mm. The so called *Kumako* race (race of two breeds) has a close resemblance to the wild silkworm both in its coloration and the form and arrangement of its patches. Although this race shows various modifications in color and markings, most of the individuals are greyish brown, with a light greenish shade. The first body segment is tinged greyish yellow in its posterior half, just like the wild silkworm; 2nd has dorsally a central dark greyish brown patch with blackish lateral rims, and 2 lateral blackish patches. The intervening line between the central and lateral markings is white, with a faint reddish shade. The 5th to 10th segments bear each a ✳ shaped light greyish yellow marking; but the latter is in most cases not so well defined as in the wild silkworm (fig. 10, a, b, c).

The 5th and 8th body segments bear a pair of imperfect oval patches which are also found in the wild silkworm. That on the 5th segment is light dull brown, and one end of a black line which does not completely surround the patch, runs in towards the middle of the patch, thus dividing it into two portions, in one of which lie 4 or 5 dull purplish dots, while in the other a few white dots. The patch on the 8th segment is elongated oval or more or less so. It is also light dull brown, and is sorrounded by a blackish line. In this patch lies a variable number of dull purplish dots arranged in a single series.

In the race *Akabiki* (a largely cultivated race of a single breed), the body is white, and the posterior half of the 1st body segment is tinged yellow. The markings of the 2nd as well as of the 5th and 8th segments are also distinctly seen, but those on the latter two segments are more or less modified in different individuals (fig. 11, a & b).

In the race *Kimai* (race of greenish cocoon), the body is also white, the marking on the 1st body segment is light. The central marking on the 2nd segment is light greenish yellow, while the two lateral markings on the same are represented each by a simple greyish dot. Each marking on the 5th segment which is oval and light greenish in color, contains a hook shaped, light greenish, curved line instead of dull purplish dots. That on the 8th segment is either oval or

round and contains a single elongated dot of a light greenish color (fig. 12, a & b).

The cocoon is elongated oval with a slight constriction near its middle, but in certain Chinese cocoons the constriction is absent and the cocoon thus assumes a spindle form. The color is either white, green or yellow. The spindle shape and the greenish color of a cocoon, are points of very close resemblance to that of the wild silkworm. The cocoon of the domestic silkworm are very variable in size, but that of our largely cultivated race is about 33 mm. in length.

Thus the adult of the cultivated silkworm has exactly similar characters, i.e. markings, venations &c. with that of the wild form, but it differs from the latter in the size and coloration as well as the lighter color of markings, but these are unquestionably variations that occurred under domestication for a long interval of time, and moreover, various transitional forms of the markings and coloration prevalent among the adult of the domestic silkworm affords a strong evidence, that the latter has been derived from the silkworm living wild still at present. Further, the egg, larva, and cocoons are nearly same in forms, markings, and coloration in both the wild and domestic forms, and the differences can be seen only in a lighter coloration, more or less imperfect markings, and size.

The above mentioned facts lead us to conclude that the domestic silkworm has been derived from the wild form which belongs to exactly the same species with the *Theophila mandarina* described by Dr. F. Moore, and the latter is nothing else than the ancestral form of our domestic silkworm.

EXPLANATION OF PL. III.

Fig. 1, a. *Theophila mandarina*, Moore, ♀. 1/1 .

Fig. 1, b. „ „ ♂. 1/1 .

Fig. 2. Fore wing of ditto showing venation. 1/1 .

Fig. 3. Larva of the first stage of ditto. 15/1 .

Fig. 4. Mature larva of ditto 1/1 ; a, patch on the 5th segment, b, same on the 8th segment, slightly magnified.

Fig. 5, a. *Bombyx mori* ♀. 1/1 .

Fig 5, b. Ditto ♂. 1/1 .

Fig. 5, c. Fore wing of ditto showing venations. 1/1 .

Fig. 6, a. *Bombyx mori* ♀. 1/1 .

Fig. 6, b. Ditto ♂. 1/1 .

Fig. 7, a. Ditto ♀. 1/1 .

Fig. 8, b. Ditto ♂. 1/1 .

Fig. 9. Larva of the first stage of *Akabiki* race, 10/1 .

Figs. 10, and ditto a. Two forms of mature larva of *Kumako* race 1/1 ; b, patch on the 5th, c, the same on the 8th segments, slightly magnified.

Fig. 11. Mature larva of *Akabiki* race, 1/1 ; a, patch on the 5th ; b, the same on the 8th segment, slightly magnified.

Fig. 12. Mature larva of *Kimai* race 1/1 , a, patch on the 5th ; b, the same on the 8th segment, slightly magnified.

Printed May 25th, 1898.

Fig. 1.

Fig. 2.

Fig. 5, c

Fig. 5.

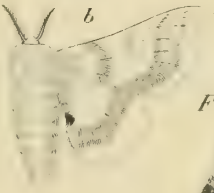

Fig. 3.

Fig. 4.

Fig. 9.

Fig. 4, a

Fig. 4, b

Fig. 6, a

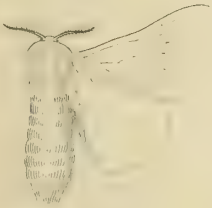

Fig. 12.

Fig. 10.

Fig. 10, a

Fig. 11.

Fig. 6, b

Fig. 12, a

Fig. 10, b

Fig. 8, a

Fig. 12, b

Fig. 10, c

Fig. 7, a

Fig. 8, b

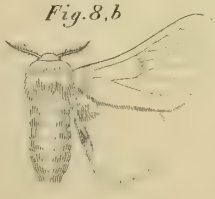

Fig. 7, b

Fig. 11, a

Fig. 11, b

Lith et Imp. E. Koshiba.

THE GENERA AND SPECIES OF ROSSELLIDÆ.

(Preliminary Notice.)

By Prof. I. IJIMA, Ph. D.

Having finished sometime since my studies of the Rossellid materials contained in the Science College Museum, I propose to give here a brief notice of the results arrived at with respect to the system of family Rossellidae. Taking into account the characters of not only parenchymal microscleres, but also as far as possible of megascleric elements, I have been led to divide the family into four subfamilies, synoptically shown as follows :

a′. Dermalia not differentiaded into autodermalia and hypodermalia. No oxyhexaster present among intermedia.....A. *Leucopsacinæ.*
a″. Dermalia differentiated into autodermalia and hypodermalia. Oxyhexaster generally present among intermedia.
  b′. Without octasters.
    c′. With plumicomes; with or without oxyhexasters.....B. *Lanuginellinæ.*
    c″. Without plumicomes; oxyhexasters always present.....C. *Rossellinæ.*
  b″. With octasters; oxyhexasters always present.....D. *Acanthascinæ.*

The definition of the family itself may remain as it stands (F. E. Schulze, Revision d. Syst. d. Asconematiden u. Rosselliden. Sitz.-ber. k. pr. Akad. Berlin, 1897).

A. LEUCOPSACINÆ.

Dermalia not distinguishable into autodermalia and hypodermalia, but consist of large pentactins, which are but little differentiated from parenchymal megascleric hexactins beyond the total absence of sixth, distally directed rays.* Gastralia, hexactins or pentactins, or both. Parenchymal megascleres contain large or medium-sized hexactins (except in *Caulocalyx*), together with diactins in

* This character of dermalia and the presence of well-developed hexactins as parenchymal megascleres probably represent a more primitive condition than what we find in other subfamilies.

greater or less quantity. As intermedia there are only discohexasters or their modification, usually in one or two kinds (macrodiscohexasters and microdiscohexasters.)

Artificial Key to Genera and Species.

a′. Parenchymal megascleres extensively fused together
  b′. Discohexaster in one kind. ..... *Euryplegma auriculare.*
  b″. Discohexaster in two kinds (including "rhopalaster") ..... *Caulocalyx irregularis.*
a″. Parenchymal megascleres loose (except at surface of attachment).
  b′. Dermalia pronged. ..... *Caulocalyx tener.*
  b″. Dermalia without prongs.
    c′. With hexactinose discohexaster.
      d′. Rays of parenchymal hexactins straight ..... *Leucopsacus orthodocus.*
      d″. Rays of parenchymal hexactins curved. ..... *Leucopsacus skoliodocus.*
    c″. Without hexactinose discohexaster.
      d′. Discohexaster in one kind ..... *Placopegma solutum.*
      d″. Discohexaster in two kinds (minute clavicome and very large discohexaster with anchor-like terminal discs) ..... *Chaunoplectella cavernosa.*

Leucopsacus, n. g.

Small, sack-like forms with smooth surface. Parenchymal megascleres consist chiefly of hexactins; diactinic parenchymalia present, but play a subordinate part. Intermedia are usually of two kinds: *macrodiscohexaster* hexactinose, i. e., six-armed as in a regular hexactin; each arm, or more properly terminal, ends with an anchor-like umbel of 3—5, strong teeth†; length of arm 50—90 μ. *microdiscohexaster*, of variable shape and size. Gastralia are usually hexactins, differing in no way from those of parenchymalia.

1. ***L. orthodocus,*** n. sp.

Body ovoid, with stalk-like base; 10 mm. long. Rays of dermal pentactins and of parenchymal or gastral hexactins straight. Hexactinose macrodiscohexaster as already characterized. Microdiscohexaster 50—88 m in diameter; each short principal with 4—8 slender terminals, which together from a bell-shaped perianth; terminal disc with 5 or 6 minuts teeth.

Loc.: Sagami Sea.

† The spicul here characterized has been figured by Schulze, Chall. Rep. Hex. Pl. LV, fig. 8. In this peculiar modification of discohexasters the axial cross is confined to the centre.

2. ***L. scoliodocus,*** n. sp.

Globular or ovoid sack, up to the size of a hazel-nut. Rays of dermal pentactins straight, but those of parenchymal and gastral hexactins curved. Hexactinose macrodiscohexaster as in foregoing species. Microdiscohexaster spherical, 46—70 μ or more in diameter; each short principal bearing 4—10, straight or nearly straight terminals; discs about equidistant at the peripheral surface of the spicule, toothed. Of inconstant occurrence is a third modification of discohexasters, which I should call *clavicome*. This most nearly resembles the sigmatocome of Schulze. Diameter 38—50 μ; principal takes about $\frac{1}{4}$ of a ray and bears a narrow perianth of very slender, terminally swollen terminals set in a single whorl.

Loc.: Sagami Sea; found attached to *Hexactinella lorica*, Ij. MS.

Chaunoplectella, Ijima.

Thick-walled goblet of egg-like shape, attached by a short stalk-like base. Parenchymal megascleres, chiefly hexactins and diactins with bent rays. Intermedia, of two kinds: large macrodiscohexaster and small clavicome.

3. ***C. cavernosa,*** Ijima.

Ijima (Zool. Anz., p. 250).

Loc.: Sagami Sea.

Placoplegma, F. E. Sch.

4. ***P. solutum,*** F. E. Sch.

Schulze (Hex. Ind. Oc., II., p. 63, pl. VI. 11—77). (Rev. Asc. u. Ross., p. 544).

Loc.: Bay of Bengal.

Aulocalyx, F. E. Sch.

5. ***A. irregularis,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 174, pl. 174, pl. LX).—(Revision Asc. u. Ross., p. 544).

Loc.: off Marion Island, SE of Cape of Good Hope.

Euryplegma, F. E. Sch.

6. ***E. auriculare,*** F. E. Sch.

Schulze (Chall. Rep. Hex.. p. 176. pl. CII). (Rev. Asc. u. Ross., p. 545).

Loc.: NE of New Zealand.

Caulocalyx, F. E. S.

7. ***C. tener,*** F. E. S.

Schulze (Chall. Rep. Hex., p. 172, pl. LXIX). (Rev. Asc. u. Ross., p. 549).

This species seems to occuppy an isolated position in this subfamily, particularly on account of the fact that hexactins are not known to occur among its parenchymal macroscleres. The "aspidoplumicome" of this species is undoubtedly closely related to the plumicome of *Lanuginellinæ* and, in my opinion, also to what I have called clavicome in *Leucopsacus skoliodocus* and *Chaunoplectella cavernosa.*

Loc.: W. of Tristan d'Acunha.

B. LANUGINELLINÆ

Dermalia with stauractinic or pentactinic autodermalia and larger pentactinic hypodermalia. Gastralia, hexactins. Parenchymal megascleres consist of diactins and of large or medium-sized hexactins. Plumicome always present among intermedia, which for the rest consist of either discohexaster or oxyhexaster, or of both.

Artificial Key to Genera and Species.

a′. Firmly attached to solid substratum. No oxyhexaster..... *Lanuginella pupa.*
a″. Rooted in loose bottom by basal tuft of anchor-like spicules. Oxyhexaster present.
  b′. Dermalia, stauractins. Intermedia in two kinds (oxyhexaster and plumicome)..... *Lophocalyx philippinensis.*
  b″. Dermalia, pentactins. Intermedia in three kinds (oxyhexaster, discohexaeter and plumicome)..... *Melonympha relata.*

Lanuginella, O. Schm.

8. ***L. pupa,*** O. Schm.

O. Schmidt (Spong.—Fauna Atl. Geb, p. 13, T. II, 1, 3).—W. S. Kent (Mouthl. Micr. Journ. 1870, p. 247, pl. LXV, 1—7) :—Schulze (Chall. Rep. Hex., p. 130, pl. LIII 3—5).—(Rev. Asc. u. Ross., p. 548).

Loc. : Atlantic; off Little Ki Island ; Sagami Sea

Lophocalyx, F. E. Sch.

9. ***L. philippinensis*** (Gray).

Rossella philippinensis, J. E Gray (Ann. & Mag. Nat. Hist., 1872, Ser. IV, Vol. X., p. 137). &c.—*Psetalia globulosa*, Gray (ibid., 1873, Vol. XI., p. 234). &c.—*Lophocalyx philippinensis*, Schulze (Chall. Rep. Hex., p. 133, pl. LIII. 1—2, pl. LIX). (Rev. Asc. u. Ross., p. 546).

Loc. : Philippine Islands ; Little Ki Island.

Melonympha, F. E. Sch.

10. ***M. velata*** (W. Thoms.)

Rossella velata, W. Thomson (Depth of the Sea, p. 418, fig. 65). Schulze (Chall. Rep. Hex., p. 143).— *Melonympha velata*, Schulze (Rev. Asc. u. Ross., p. 547).

Loc. : Strait of Gibraltar.

C. ROSSELLINÆ.

Autodermalia variable. Pentactinic hypodermalia generally present, sometimes wanting. Gastralia, hexactins, sometimes pentactins Parenchymal macroscleres, chiefly diactins, may however enclose medium-sized or small hexactins. As intermedia, oxyhexasters absent or more generally present in one or two kinds.

Artificial Key to Genera.

a′. Hypodermal pentactin wanting.
  b′. Sack-like or vase-like forms without distinct stalk.....*Aulosaccus.*
  b″. Body with gastral surface everted so as to form a large part of the outer surface ; with long, tubular stalk.....*Aulochone.*
a″. Hypodermal pentactin present.
  b′. Intermedia, only oxyhexaster.....*Bathydorus.*
  b″. Intermedia include discohexaster besides oxyhexaster.
    c′. Discohexaster in one kind.

d′. Autodermalia; pentactins with boss-like rudiment of distal sixth ray; occasionally hexactins.....*Hyalascus.*
d″. Autodermalia stauractins or pentactins, or both; without rudiment of distal ray and never hexactinic.
e′. Forms without distinct stalk.....*Vitrollula.*
e″. Forms with long, distinct stalk.....*Crateromorpha.*
c″. Discohexaster in two kinds.....*Rossella.*

Bathydorus, F. E. Sch.

Autodermalia, diactins, stauractins or pentactins. Hypodermal pentactin present. Gastralia, probably always hexactins. Parenchymal megascleres with or without hexactins. Intermedia, oxyhexaster only.

Artificial Key to Species.

a′. Autodermalia, almost exclusively straight diactins.....*B. baculifer.*
a″. Autodermalia, predominatingly stauractins.
b′. General surface smooth, without diactinic prostalia.
c′. Cup-like forms, expanded above and without marginal fringe of spicules.....*B. laevis.*
c″. Tubular forms, with a fringe of marginalia.....*B. fimbriatus.*
b″. General surface with diactinic prostalia.
c′. Oxyhexaster with principals exceedingly shortened as to be almost annulled.....*B. stellatus.*
c″. Oxyhexaster with distinct cylindrical principals.....*B. spinosus.*

11. ***B. fimbriatus,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 152, pl. LVIII). (Rev. Asc. u. Ross., p. 533).

Loc.: North Pacific.

12. ***B. stellatus,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 152, pl. LIX 1—5). (Rev. Asc. u. Ross., p. 534).

Loc.: Messier Channel in Patagonia.

13. ***B. spinosus,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 153, pl. LIX 6—9). (Rev. Asc. u. Ross., p. 534).

Loc.: Pinguin Islands.

14. ***B. baculifer,*** F. E. Sch.

Schulze (Chall Rep. Hex, p. 154, pl. LIX 10—18). (Rev. Asc. u. Ross., p. 535).

Loc.: South Pacific.

15. ***B. laevis,*** F. E. S.

Schulze (Hex. Ind. Oc., II, p. 57, T. VI 1—10). (Rev. Asc. u. Ross., p. 535).

Loc.: Bay of Bengal.

Vitrollula, n. g.

Autodermalia, stauractins or stauractins and pentactins. Hypodermal pentactin present. Gastralia, hexactins and pentactins. Parenchymal megascleres with or without hexactins. Intermedia, of oxyhexaster and discohexaster; the latter in one kind.

This genus is closely related to *Crateromorpha*, but is distinguishable by the absence of distinct stalk to the sponge body.

16. ***V. fertile,*** n. sp.

Body ovoid or spindle-shaped, attached by one end to firm substratum; small, up to 15 mm. in total length. Autodermalia, of sparingly rough stauractins with rays 180—340 μ long. Hypodermal pentactin moderately large. Gastralia, hexactins and pentactins occurring in a sparing number. Parenchymal megascleres, chiefly diactins, but hexactins are of common occurence amongst them. Intermedia of two kinds: *Oxyhexaster*, 120 μ in average diameter; each short principal bearing 4—7, slender, straight, rough-surfaced, divergent terminals. *Microdiscohexaster*, of usual shape, 26—30 μ in diameter.

All specimens examined contained numerous larvae in various stages of development. These are at a certain stage spherical, covered externally by ciliated cell-layer and contain internally a mass of cells. Stauractinic spicules are the first that appear in the periphery of the internal mass. Later, the larvae are spindle-shaped, thickest nearer to one end.

Loc.: Sagami Sea.

17. ***V. namiyei,*** n. sp.

Slightly compressed sack with broad irregular base and a firm wall of moderate thickness. Dimensions, 76 mm. high and 30—56 mm. broad. The sponge has tendency to produce secondary oscula or persons by budding or division. Autodermalia consist of stauractins and pentactins with stout, strongly prickly rays, 90—165 μ long. Gastralia, of pentactins and hexactins, constituting a continuous antogastral layer. Parenchymal megascleres are exclusively diactins. Intermedia: *Oxyhexaster*, 52—76 μ in diameter; each very short principal bearing 2—4, diverging, nearly straight, minutely prickly terminals. *Discohexaster* spherical, 50—100 μ in diameter; principals exceedingly short, each with 3—5 or more, slender terminals that end with distinctly toothed discs.

But for the absence of a distinct stalk and the presence of hexactinic antogastralia, this species might be put under *Crateromorpha*.

Loc.: Sagami Sea.

Crateromorpha (J. E. Gray) Carter.

Autodermalia, hypodermalia and intermedia as in foregoing genus. Gastralia, pentactins; occasionally stauractins. Sponge-body with distinct narrow stalk, which generally contains a system of anastomosing canals.

Artificial Key to species.

a′. Autodermalia, stauractins and pentactins.
  b′. The wall with a system of anastomosing intercanals; through-going passages present at the junction of body with stalk.....*C. corrugata.*
  b″. Without above-mentioned characters.
    c″. Microdiscohexaster spherical; stalk with anastomosing canals.....*C. meyeri.*
    c′. Microdiscohexaster with each bunch of terminals making a prominence at surface; stalk simply tubular .....*C. thierfelderi.*
a″. Autodermalia, exclusively pentactins; hypodermal pentactin unusually thick-rayed.....*C. pechyactina.*
a‴. Autodermalia, almost exclusively stauractin; discohexaster thick-rayed .....*C tumida.*

18. ***C. meyeri*** (J. E. Gray) Carter.

Carter, Gray, etc.—Schulze (Chall. Rep. Hep. Hex., p. 161, pl. LXI). (Rev. Asc. u. Ross., p. 540).

Loc.: Philippine Islands; Sagami Sea.

Besides typical *C. meyeri* there occur in Sagami Sea two varieties:

α. ***C. meyeri*** var. ***tuberosa.***

Larger than typical *meyeri*; 200 mm. or more in height. The wall projects externally in a number of small or large, irregularly rounded, hillock-like or tubercle-like prominences. A large quantity of diactins enters into the composition of hypodermal strands; otherwise of essentially same spiculation as in typical species.

β. ***C. meyeri*** var. ***rugosa.***

Also larger than typical *meyeri*; almost a foot in height. The wall with irregular prominences, while the general surface is extremely uneven on account of numerous wrinkle-like ridges. Spiculation as in var. *tuberosa.*

19. ***C. pachyactina,*** n. sp.

Shape and size like *C. meyeri* var. *tuberosa* or *rugosa.* Sponge of rather compact texture, with scanty narrow afferent apertures. Both autodermalia and gastralia are pentactins. Hypodermal pentactins strong, unusually thick-rayed ($\frac{1}{3}$ mm. thick with ray length of $2\frac{1}{4}$ mm). Intermedia as in *C. meyeri.*

Loc.: Tosa Sea (Shikoku).

20. ***C. corrugata,*** n. sp.

Sponge-surface with numerous pit-like or irregular depressions leading into a system of anastomosing intercanals. Through-going passages present at the junction of body with stalk, i. e., the latter divides into a number of branches at the upper end. Up to about a foot in height. Autodermalia stauractins and pentactins, the former predominating. Gastralia, mostly stauractins. Intermedia resemble those of *C. meyeri* or *C. pachyactina.*

Loc.: Sagami Sea.

21. ***C. thierfelderi,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 164, pl. LXII 1—4). (Rev. Asc. u. Ross, p. 540):—*C. murrayi,* Schulze (Chall. Rep. Hex, p. 164, pl. LXIII).

Loc.: Little Ki Island.

22. ***C. tumida,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 166, pl. LXVII and pl. LXVIII 2). (Rev. Asc. u. Ross., p. 541).

Loc.: Banda Islands.

Aulochone, F. E. Sch.

Autodermalia and gastralia, predominantly or exclusively pentactins. Hypodermal pentactins wanting. Parenchymal megascleres without hexactins. Sponge-body with gastral surface everted to a great extent so as to form a large part of the external surface; with long tubular stalk.

23. ***A. cylindrica,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 168, pl. LXVI and pl. LXVIII 1).—*Crateromorpha cylindrica*, Schulze (Rex. Asc. u. Ross, p. 542).

Loc.: NE of Kermadec Islands.

24. ***A. lilium,*** F. E. Sch.

Schulze (Chall. Rep. Hex., pl. 171, pl. LXVIII 3—7).—*Crateromorpha lilium*, Schulze (Rev. Asc. u. Ross., p. 542).

Loc.: Meangis Islands, NE of Celebes.

Hyalascus, Ijima.

Autodermalia, pentactins with distally directed sixth ray represented by a knob-like boss; occasionally genuine hexactins. Pentactin hypodermalia present. Gastralia hexactins. Parenchymal megescleres, solely diactinic. Intermedia of two kinds: *Oxyhexaster* with 1 or more and often all principals bearing only one terminal (hemi-oxyhexaster and hexactinose oxyhexaster). *Discohexaster* of small or moderately large size. Sponge-body probably unstalked, vase-like.

This genus is decidedly to be taken up in *Rossellinæ*, notwithstanding the occasional occurrence of hexactinic autodermals.

25. ***H. sagamiensis,*** Ijima.

Ijima (Zool. Anz., 1896, p. 251).

Loc.: Sagami Sea.

26. ***H. giganteus,*** n. sp.

Known to me by a very large fragment of light, cavernous texture. Efferent apertures on gastral side as large as 18 mm. in diameter, covered over by an irregularly meshed lattice-work consisting mainly of strands of hypogastral di-

actins. Afferent apertures smaller. Spiculation similar to that of foregoing species, but rays of autodermalia and autogastralia almost smooth at base; intermedial oxyhexaster 76—103 μ in diameter; discohexaster 60—76 μ in diameter, with about 6 slender terminals to each principal.

Loc.: Sagami Sea.

Rossella, Carter.

Autodermalia, stauractins or pentactins. Hypodermal pentactin present. Gastralia, hexactins. Parenchymal megascleres may contain hexactins of medium size or under. Intermedia consist of oxyhexaster and of two kinds of discohexasters (macrodiscohexaster and microdiscohexaster).

27. ***R. antarctica,*** Carter.

Carter (Ann. and Mag. Nat. Hist., 1872, p. 409). Schulze (Chall. Rep. Hex., p. 139, pl. LV). (Rev. Asc. u. Ross., p. 536).—*Acanthascus grossularia*, Schulze (Chall. Rep. Hex., p. 145, pl. LVI).

Loc.: S. of Kerguelen Isl.; SE of Prince Edwards Isl.; Possession Isl.

28. ***R. longispina,*** Ijima.

Ijima (Zool. Anz., 1896, p. 253). Schulze (Rev. Asc. u. Ross., p. 538).

Loc.: Sagami Sea.

29. ***R. dubia*** (F. E. Sch.)

Acanthascus dubius, Schulze (Chall. Rep. Hex., p. 147, pl. LVII 8—13).—*Rossella dubia*, Schulze (Rev. Asc. u. Ross., p. 537).

Loc.: S. of Puerto Bueno, Patagonia.

Aulosaccus, Ijima.

Autodermalia, stauractins or pentactins. Hypodermalia, only diactins; without pentactins. Gastralia, hexactins. Parenchymal megascleres, only diactins. Intermedia consist of oxyhexasters with tendency to become hemihexactinose or even perfectly hexactinose, and of two kinds of discohexasters (macrodiscohexaster and microdiscohexaster).

30. ***A. schulzei,*** Ijima.

Ijima (Zool. Anz., 1886, p. 252). Schulze (Rev. Asc. u. Ross., p. 543).

Loc.: Sagami Sea.

31. ***A. mitsukurii,*** n. sp.

Autodermalia, stauractins with occasional pentactins; rays stout, strongly spiny, 110—176 μ long. Gastralia with rays twice or more than twice as long as in autodermalia. Oxyhexaster with diameter of 100—130 μ; occasionally hemi-hexactinose, rarely hexactinose. Macrodiscohexaster spherical, 80—120 μ in diameter; with no less than 5, moderately thick, straight terminals to each very short but thick principal; terminal disc small with minute marginal teeth. Microdiscohexaster of usual shape; diameter 20—23 μ.—Thick-walled, sack-like sponge with prostal needles and hillocky elevations on external side, so that it closely resembles *Acanthascus cactus*.

Loc.: Sagami Sea.

D ACANTHASCINÆ.

Autodermalia variable. Hypodermalia with pentactins or exclusively diactinic. Gastralia, hexactins as a rule. Parenchymal megascleres exclusively diactins. Intermedia consist of oxyhexasters and of two kinds of discohexasters, *octasters* and microdiscohexasters.

Key to Genera.

a′. Hypodermal pentactins present.
  b′. Hypodermal pentactin not pronged. ..... *Staurocalyptus.*
  b″. Hypodermal pentactin pronged. ..... *Rhabdocalyptus.*
a″. Hypodermal pentactin wanting. ..... *Acanthascus.*

Staurocalyptus, Ijima.

Paratangential rays of hypodermal pentactins not armed with hook-like prongs.

Artificial Key to Species.

a′. Autodermalia almost exclusively or predominantly pentactins; at least with a large number of pentactins.
  b′. Octaster with radius of 72–145 μ. ..... *S. dowlingi.*
  b″. Octaster with radius of 65—85 μ; autodermalia slender-rayed, often stauractins. ..... *S. roeperi.*
a″. Autodermalia almost exclusively or at least predominantly stauractins.
  b′. Octaster large, usually more than 200 μ in radius. ..... *S. glaber.*
  b″. Octaster small, not larger than 100 μ in radius.

c'. Autodermalia with occasional pentactins and triactins; rays faintly rough.....*S. heteractinus.*
c''. Autodermalia almost exclusively stauractins, strongly prickly.....*S. microchetus.*
a'''. Autodermalia, straight diactins.....*S. pleorhaphides.*

32. ***S. dowlingi*** (Lambe).

Rhabdocalyptus dowlingi, Lambe (Trans. Roy. Soc. Canada, Sect. IV, 1893, p. 37, pl. III 2—2h). Schulze (Rev. Asc. u. Ross., p. 554).—*Stauroca'yptus dowlingi*, Ijima (Annot. Zool. Jap., vol. I, p. 53).

Loc.: Strait of Georgia, Vancouver Isl.; Sagami Sea.

33. ***S. roeperi*** (F. E. Sch.).

Rhabdocalyptus roeperi, Schulze (Chall. Rep. Hex., p. 158 pl. LXV). (Rev. Asc. u. Ross., p. 553).—*Staurocalyptus roeperi*, Ijima (Annot. Zool. Jap., vol. I, p. 55).

Loc.: S. of Puerto Bueno, Patagonia.

34. ***S. glaber,*** Ijima.

Ijima (Annot. Zool. Jap., vol. I, p. 57).

Loc.: Sagami Sea.

35 ***S. microchetus,*** n. sp.

A rather thin-walled compressed sack of moderately firm texture. Length 95 mm.; breadth 23 mm. by 37 mm.; thickness of wall at middle 3 mm. Afferent apertures small, not over 1 mm. in diameter.—Autodermalia, stauractins with attenuated, strongly prickly rays 85 μ in average length. Hypodermal pentactins small, with paratangential rays only about 1 mm. long; they are protruded out of dermal layer and form a veil at about 1 mm. distance from the surface. Gastralia, hexactins with rays similar to those of autodermalia. Some parenchymal diactins as long as 20 mm. or more. Oxyhexaster 90—106 μ in diameter; rays rather slender, 2—3 and occasionally only 1 terminal to a very short principal. Octasters abundant near gastral surface, 114—136 μ diameter; terminals weakly bent S-like, 7—12 forming an outwardly expanded bunch; principal thick, taking about $^2/_3$ of the length of an entire ray. Microdiscohexasters of usual size and shape exceedingly rare.

Loc.: Sagami Sea.

36. ***S. heteractinus,*** Ijima.

Ijima (Annot. Zool. Jap , vol. I. p. 56).

Loc.: Sagami Sea.

37. ***S. pleorhaphides,*** Ijima.

Ijima (Annot. Zool. Jap., vol. I, p. 58).

Loc.: Sagami Sea.

Rhabdocalyptus, F. E. Sch.

Paratangential rays of hypodermal pentactins armed with biserially arranged hook-like prongs.

Artificial Key to Species.

a′. Autodermalia, pentactins and stauractins; octaster 30—40 μ in radius.....*R. dawsoni.*
a″. Autodermalia, predominantly stauractins; octaster 90—120 μ in radius.....*R. victor.*
a‴. Autodermalia, predominantly straight diactins.
b′. Octaster 65—88 μ in radius.....*R. mollis.*
b″. Octaster smaller, 38–55 μ in radius.....*R. capillatus.*

38. ***R. dawsoni*** (Lambe).

Bathylorus dawsoni, Lambe (Trans. Roy. Soc. Canada, Sect. IV, 1892, p. 73, pl. IV 2 and pl. VI 2—2k).—*Rhabdocalyptus dawsoni,* Schulze (Rev. Asc. u. Ross., p. 555).

Loc.: near Vancouver Isl.

39. ***R. victor,*** Ijima.

Ijima (Annot. Zool. Jap., vol. I, p. 52).

Loc.: Sagami Sea.

40. ***R. mollis,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 155, pl. LXVI). (Rev. Asc. u. Ross., p. 552).—Ijima (Annot. Zool. Jap., vol I, p. 50).

Loc.: Sagami Sea.

42. ***R. capillatus,*** Ijima.

Ijima (Annot. Zool. Jap , vol. I, p. 51).

Loc.: Sagami Sea.

Acanthascus, F. E. Sch.

Hypodermal strands consist exclusively of diactins.

42. ***A. cactus,*** F. E. Sch.

Schulze (Chall. Rep. Hex., p. 148, pl. LVII 1—7). (Rev. Asc. u. Ross., p. 551).—Ijima (Annot. Zool. Jap., vol. I, p. 48.

Loc.: Sagami Sea.

43. ***A. alani,*** n. sp.

An ovoid, thick-walled goblet, 190 mm. high; attached by a short stalk-like base. Prostal needles unknown; possibly not present.—Autodermalia exclusively pentactins with rather slender rays, 95—170 μ long Hypodermal strands of indefinite calibre. Gastralia, hexactins, not forming a continuous layer. Oxyhexasters large, with diameter of 144—190 μ; terminals more or less slender, unusually 3—4 to each extremely short knob-like principal; central node spherical. Octasters with radius of 68—110 μ; principal about as long as or longer than terminals, of which 6—8 form an outwardly expanded tuft. Microdiscohexaster of usual shape and size present in a sparing number.

Loc.: Sagami Sea.

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PRELIMINARY NOTICE OF NEW JAPANESE ECHINOIDS.

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Since the publication of my paper on Asthenosoma in Vol. I, Part I of this periodical I have found many new species of echinoids from various parts of Japan. The following contains an account only of their important diagnostic characters. The full paper will be published afterwards, with illustrations.

1. *Cidaris* (*Stereocidaris*) *tenuispinus*, nov. sp.

The general appearance of test and the form of spine at once distinguish this species from other known members of the genus. Test is regularly arched on abactinal side, but actinally it becomes suddenly curved from ambitus, and has a slight concavity near peristome. The color of membrane is dark brown. Basals are almost equal in both height and breadth, radials distinctly excluded from basals. The interambulacrum is three times as wide as the ambulacrum. The scrobicular area is elliptical in form even at ambitus. The miliares in each interambulacral plate are very few. The interporiferous area of ambilacrum carries four regularly arranged vertical rows of tubercles. The primary spines are slender. The fully developed one appears from 3rd or 4th interambulacral plate, so that the whole abactinal side seems to be almost devoid of primary spines. The first is longest having the length of 47 mm. and a uniform breadth of 1·5 mm., in a specimen having the test of 35 mm. in diameter. All spines are grey and very indistinctly striated on the surface, and some being quite smooth. Those near peristome are flattened, but never crenulated. The miliary spines are very small, with a thick brownish membrane at the base.

Loc.: Sagami Sea.

2. *Cidaris* (*Stereocidaris*) *microtuberculatus*, nov. sp.

This greatly resembles *S. grandis*, Död. But each basal plate has a dis-

tinctly greater width than height. The inner plates of anal system are not very small compared with outer plates; width of interambulacrum generally greater than that of ambulacrum, being 4—5.4 times as measured at ambitus from tests of 25.5—66 mm. in diameters. Ambulacrum very slightly wavy, with very slightly sunken poriferous zone, and never so strongly curved as in *S. grandis*, Död. Interporiferous area tuberculated with two outer and four inner longitudinal rows, the latter carrying very small scaly spines less than one quarter as long as the outer ones. All miliares on the test and abactinal system smaller in size than in *S. grandis*, Död. Neck of primary spine white. Spines near peristome not flattened even in comparatively young specimens (25.5 mm. diam).

Loc.: Sagami Sea.

3. *Cidaris* (*Porocidaris*) *misakiënsis*, nov. sp.

Test more flattened than in *C. elegans*, A. Ag. Covering membrane (especially on abactinal side) and the collar of spine deep brown. Basals not extending to peripheral margin of anal system. Both ambulacral and interambulacral plates at ambitus without any bare median space. There is one vertical row of tubercles between the scrobicular circle and median interambulacral suture. Primary spines white, with a brownish collar 4 mm. high in the longest spine belonging to a test of 39 mm. in diameter, which measured 100 mm. Secondary spines brownish; those on ambulacrum arranged in a single vertical row in each zone.

Loc.: Sagami Sea.

4. *Mespilia levituberculatus*, nov. sp.

Test globular, reddish with yellow or green bare space. Actinal side not so swollen as abactinal side, but not depressed. Primaries and secondaries very small, not perforated or crenulated, thus differing from any other species of *Mespilia*, arranged in each interambulacral zone in two horizontal rows (adoral row having only secondaries) and in five vertical rows at ambitus. Ambulacral pores three in number in each plate, forming two vertical rows. Poriferous zone traversed by two regular or irregular vertical rows of tubercles. On the ambulacrum and interambulacrum there are found bare median spaces crowded with brown pedicellariæ. On the actinal side, however, these bare spaces together with the pedicellariæ are absent. Spines longitudinally striated with orange

stripes, and tipped with white. Near peristome they are flattened.

Beside the above mentioned characters, this species differs from *M. g'obulus*, A. Ag. in having more tuberculated and higher basal plates, and in median bare space being not so distinctly separated from the portion of tubercles; from *M. Whitmani*, A. Ag. it differs in the height of its test, the number of tubercles at ambulacrum, and the tuberculation of anal plates.

Loc.: Not uncommon in Misaki and Dsushi (Sagami), Kominato (Awa) Gōnoura (Iki).

5. *Salmacopsis pulchellimus*, nov. sp.

Test globular, ambital outline indistinct and circular. The general ground color is green and red, not white and olive brown as in *S. olivacea*, Död. At ambitus each ambulacral plate has arcs of three ambulacral pores, forming two vertical rows, extending to peristomal margin. In each plate of ambulacrum there is one horizontal row of alternating primary and secondary tubercles composed of three of the former and a few of the latter, and another horizontal row lying on the upper side, composed of a small number of small secondaries, but the part lying below the first mentioned horizontal row is entirely destitute of tubercles. Surface of both interambulacral and ambulacral plates not smooth, and the furrows converge from each pit to median primary tubercles. Tubercles smooth, not crenulated. Spines longest at ambitus (5 mm. in a test of 21 mm. in diameter), greenish, tipped and banded with light red color.

Loc.: Tomo (Bingo).

6. *Echinostrephus pentagonus*, nov. sp.

This species resembles greatly *E. molare*, A. Ag., but on examining many specimens with the diameter varying between 19.5 mm. and 28 mm. I find the following important differences which justify us in making a new species.

1. The anal system is covered with many miliares of very small plates.
2. There are only three pairs of ambulacral pores in each arc.
3. The whole abactinal system is naked, except the radials which have only two secondaries on each plate.
4. The outline is distinctly pentagonal.

Loc.: Bonin Islands.

7. *Echinus multicolor*, nov. sp.

Test variegated. First in interambulacrum there appears a greenish color which becomes suddenly brown at ambitus; interporiferous area white on abactinal side, but actinally banded with three or four broad brownish bands, leaving narrow white spaces between. Anal plates not provided with tubercles. Two or three small tubercles distributed on each plate of abactinal system. Interambulacral plate at ambitus with four tubercles; ambulacral plate with one primary tubercle, and another smaller one which is present only on the inner side. Poriferous zone with an irregular row of pores, three pairs forming an arc, without any tubercle between each pore. Spines longitudinally striated, tipped with two or three violet stripes, longest one measuring 3 mm. in a test of 14 mm. in diameter.

Number of coronal plate (which is 16), arrangement of ambulacral pores, other structures of test, and the color of spine distinguish this species from all known members of the genus.

Loc.: Akune (Satsuma).

8. *Fibularia acuta*, nov. sp.

The general outline is like that of a hen's egg, pointed anteriorly, and broad posteriorly. The height is not uniform; the anterior part being higher than the posterior and making the wall of actinostome very convex. Apical system lies on the anterior side of test. Anus elliptical, equal in size with or larger than the length of mouth (that is $\frac{1}{3}$ the radius) and separated from the mouth by about $\frac{1}{4}$ the length of the radius. Ambulacral pores extending for 3 mm. in a test 10 mm. long and 6.5 mm. broad, and reaching outwards more than $\frac{1}{2}$ the radius, and diverging greatly. On actinal side there are scattered tentacles coming out from single pores. The tubercles are not closely distributed on the actinal side as in *F. volva*, Agass. The ridges are very slightly visible actinally and this only at the median ambulacral and interambulacral lines. There are no prominent miliares near actinostome as in *F. volva*, Ag., and *F. australis*, Desm.

Loc.: Misaki (Sagami), Shigajima (Chikuzen).

9. *Plesianthus ogasawaraënsis*, nov. sp.

Test elliptical, with a slightly undulating ambitus, differing from *P. excelsior*,

Död. The test (74 mm. by 86 mm.) is widest not only on the side opposite the anterior extremity of the rosette, but also in the line drawn through its posterior extremity. Actinal surface concave, not flattened as in *P. excelsior*, Död. Suture between interambulacral and ambulacral plates distinctly recognizable from external surface, while that of *P. japonicus*, Död. is entirely invisible from outside. General ground color grey, poriferous zone reddish. Ambulacral furrow reaches the ambitus, but very indistinct in *P. clypeus*, Död. Spine with red stripes, thus differing from *P. japonicus*, Död. Tubercles fewer than in the last mentioned species. *P. subdepressus*, Gray differs from the present species in having the greatest width at the posterior part, in the test rising suddenly at the extremities of ambulacral petals, in the lanceolate form of the petals, and the yellowish-green ground color with deep carmin colored poriferous zones; *P. humilis*, Leske differs in having the uniform breadth of periostome; *P. rotundis*, A. Ag. differs in having a rather circular outline, spindle shaped ambulacral rosette and the greatest width near centre. It is needless to give the distinction between this and the remaining species.

Loc.: Bonin Islands.

10. *Echinarachnis tenuis*, nov. sp.

Ground color white to light violet. Outline pentagonal, with a strongly wavy contour. Anus lying on the abactinal side; the part of the test where it lies not pointed. Test extremely thin. Ambulacral rosette extending half the radius and widely open. Ambulacral furrow almost unrecognizable. Suture between each two plates visible from surface. Primary and secondary spines have the greatest thickness of membrane. Diameter of the largest specimen 30 mm.

Loc.: Kominato (Awa).

Printed June 10th, 1898.

MISCELLANEOUS NOTES.

On the Appearance of the Grey Phalarope in Uraga Channel. —According to Seebohm the Grey Phalarope (*P. fulcarius*) is a winter visitor to the Kurile Islands "but it has not yet been recorded from Japan proper."

On the 27th Nov. '94 Mr. J. C. Haitland of Yokohama obtained one specimen in that neighborhood, and I have no record of any other examples taken in Japan proper until the occurrence referred to below.

On the 8th of this month (April) the Yacht "Golden Hind" left Uraga for Ukishima to see if possibly the Swifts (*C. pacificus*) had arrived at their breeding place there. However we did not see any, and as a hard and cold north wind was blowing we made for Misaki. On the way we saw several flocks of small birds which we took to be Turnstones (*S. interpres*).

Next day we sailed down to the Doketsuba off Sunosaki, and we found the sea swarming with these same small birds, which on shooting we found to be Grey Phalaropes. Some were white on the lower parts, others in their breeding plumage or partly so. The numbers seen can only be described as *myriads*. They were in flocks of four or five to a couple of hundred in every direction either flying about or sitting on the surface of the water busily feeding. The weather was cloudy and many other birds were about. Albatross, Shearwater, Gannet, Auks, Cormorants, and Divers (*C. arcticus?*)—these latter were particularly numerous.

On the night of the 9th it rained heavily, and next morning a strong southerly gale came up. By noon the wind decreased somewhat and at 2 o'clock "Gold Hind" left Misaki for Yokohama. When rounding Tsurugisaki a tremendous sea was running but the Phalaropes were still about in smaller numbers. They were sitting on the sea but had to fly up whenever a huge comber threatened to come tumbling down on them. Inside Tokyo Bay we found it calm and near Futsusaki there were a great many more of these Phalaropes.

I may add that the Misaki fisherman Kumakichi was with us and he said he had never seen these birds before. As fishermen are so accustomed to watch the birds for indications as to the whereabouts of the fish it is not likely that he would have failed to notice the Phalarope on a previous occasion, which tends to show that the present occurrence is exceptional.

Alan Owston.

Zoological Society of Tokyo.—The monthly meetings of the Society for October—March were held in the lecture room of the Zoological Institute of the Imperial University. The following papers were read:

October 16.—Prof. IWAKAWA on the "Fresh-water and Land Mollusca of South-Central Japan." He pointed out the difference of the prevailing forms of this part and those of the northern part with reference to the fresh-water forms. Thus, *Paludina exilicapis*, the common form in the north, does not occur in the south-central part, while *Pal. ingallsiana*, the prevailing form of the latter is not found in the north; so also, the genus *Dipsas* which is very common in the north is rather uncommon in south-central Japan, where it is mostly replaced by *Anodonta*.

November 20.—Prof. ISHIKAWA on the "Spawning and Larva of Megalbatrachus Sieboldii."

December 18.—Mr. YOSHIWARA on "Japanese Echinoidea."

January 29.—Mr. TATA reported on his collecting tour in Formosa.

Mr. AIDA on the "Fauna of the Western Coast of Izu."

February 19.—Mr. YOSHIWARA on "a Fossil Astriclypeus from Kōshū."

Mr. IIZUKA on "the Annelids of the Northern Shore of the Bay of Suruga."

March 19.—Mr. MIYAJIMA on "Veretillum floridum, n. sp."

Mr. AIDA on the "Structure and Habit of the Manis from Formosa."

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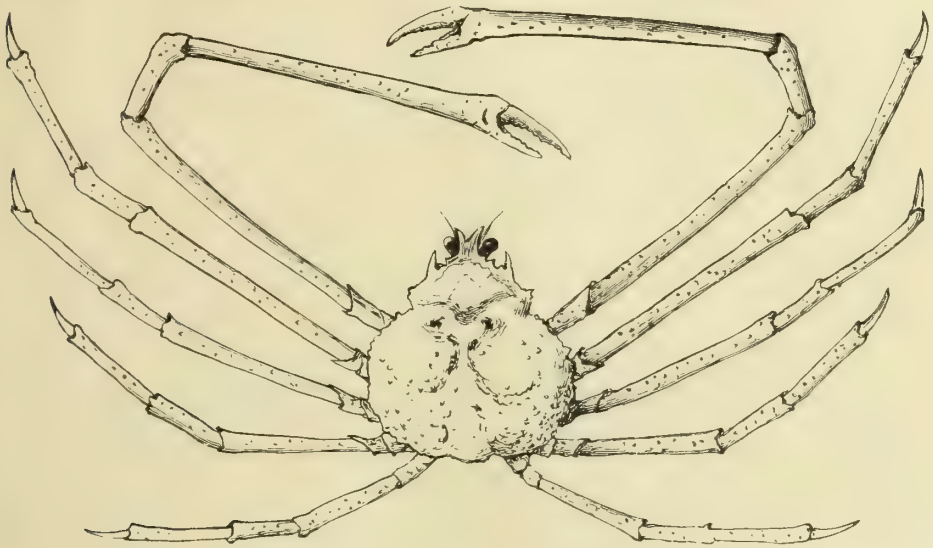

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ANNOTATIONES ZOOLOGICÆ JAPONENSES

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SPECIAL NOTICE.

Volume I and its parts are no longer sold at the original price, but will be charged for at the same rate as the succeeding volumes and parts (vide supra).

NEW OR IMPERFECTLY KNOWN SPECIES OF EARTHWORMS. NO. 1.

By **SEITARO GOTO**, Professor, and **SHINKICHI HATAI**, Assistant.
First High School Tokyo.

In this series of papers we purpose to describe new or imperfectly known species of earthworms collected from various parts of the Japanese Empire; and at the outset we wish to state clearly the respective part which each of us has taken in the work. For the practical portion of the work as well as the determination of new species the credit is entirely due to the junior writer (H), while for a general supervision of the work and the form in which the results are presented the senior writer is alone responsible. The species will be described without any definite order, as their study is completed. In the present paper we have put together only the species of the genus *Perichæta* that have come into our hands.

The following characters, which are, unless otherwise stated, common to all, have been omitted in the following descriptions: (1) Gizzard in VIII—IX; (2) ovaries in XIII, oviduct pore in XIV; (3) spermduct pores in XVIII.

1. ? *Perichæta Sieboldii*, Horst.

We mention this species, the oldest known to science from Japan, with a query, because, strange to say, we have not yet come across any specimen exactly answering to its descriptions given by European writers. They all agree in stating that the spermathecæ are situated in VI/VII, VII/VIII, and VIII/IX, and the number of setæ between the male genital pores are given as 13,* while for the spermathecal region it is given as 76 by Rosa and 80 by Horst.† Now the numerous specimens which we regard as belonging to *P. Sieboldii* all present this difference that, the spermathecæ lie in V/VI,

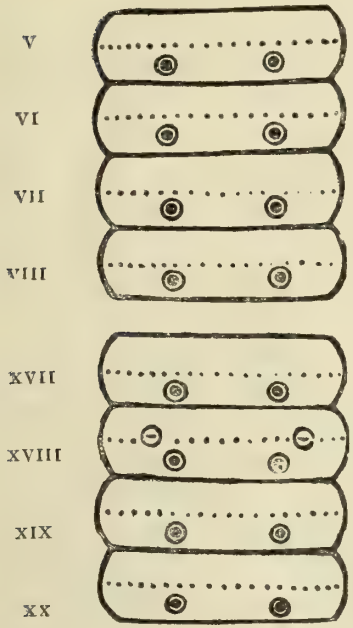
* Rosa, D.—Die exotischen Terricolen des K. K. naturhistorischen Hofmuseums (Wien), 1891, p. 401; "Die männlichen Geschlechtsöffnungen am 18. Segment liegen in der 14. Borstenlinie."

† We have not been able to gain access to Horst's original description, and have therefore relied on references by later writers.

VI/VII, and VII/VIII, therefore one segment anteriorly than is stated to be the case by previous writers, while the number of setæ lying between the male pores we have observed to be 14-19, and the same in the spermathecal region to be about 60. The last two points cannot, in our opinion, be regarded as of much systematic importance, as we have learnt from our experience, that they are rather frequently subject to variation. It must sound presumptuous in us to suppose that all the previous observers have fallen into the same error; but it must at the same time be admitted as a strange circumstance that we have never met with any specimen answering to the description of previous writers, although we have made a rather extensive collection in the same locality whence the specimens of the European writers are known to have come or have presumably been collected. On the cohtrary there have come under our obs rvation at least more than two hundred specimens differing from *P. Sieboldii* in a single character of systematic importance, viz. the position of the spermathecæ mentioned above. These worms are very common in this part throughout the warmer months of the year, and the are widely distributed, since we have specimens also from Sendai, Shizuoka, and Tsugaru. They are therefore the most likely to be represented in any chance collection of earthworms from this part of Japan; and we know that *P. Sieboldii* is represented in all the European collections of earthworms made in Japan, of which we have record (Leyden, Vienna, Oxford, Berlin). It would be preposterous to suppose that all the specimens in Europe presented precisely the same variation. We therefore await the result of a renewed examination on the part of European students.

2. *Perichæta fusca'a*, n. sp.

Length of body 150 mm., breadth 5 mm.; number of segments 110; dusky colored on the back, lighter colored on the ventrum. Clitellum XIV—XVI, without setæ. Towards the two extremities of the body the boundary lines between the segments are very distinct and the setæ are longer; number of setæ smaller in the anterior segments, being 24-25 in the spermathecal segments and about 35 in the more posterior segments. First dorsal pore XIII/XIV; spermathecal openings four pairs, V/VI, VI/VII, VII/VIII, VIII/IX; V, VI, VII, VIII with a pair of genital papillæ behind the chætal line; oviduct pore single; male openings on the top of papillæ; XVII, XVIII, XIX, XX with a dair of genital papillæ situated inside the line of the male pores and behind the

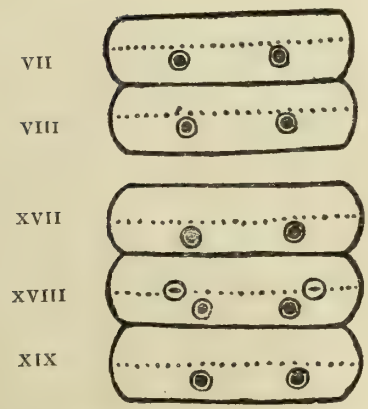


chætal line; male pores separated by 9 setæ.

Intestine begins in XV; *intestinal cœca one pair in XXVII;* thickened septa V/VI —VII/VIII in front of the gizzard, and X/XI—XIII/XIV behind it, septum IX/X very thin and transparent, septum VIII/IX absent. Spermathecæ four pairs, in VI, VII, VIII, IX, with diverticula longer than the sac and enlarged at the blind end. Testes in X, XI; sperm reservoir in XI, XII; ovary small, close to the ventral body wall. Ovisacs (*receptaculum ovorum*) two pairs, in XIII, XIV, with the proximal portion attached to the septa between these segments and the next preceding. Prostate gland small, and only slightly lobulated. Last heart in XIII.

Loc.—Kamakura.

3. *P. campestris,* n. sp.



Length of body 120 mm., breadth 6 mm., number of segments 77. Clitellum XIV—XVI, without setæ. Number of setæ in the spermathecal segments 35, but in XVIII there are 47; generally speaking there are fewer setæ in the more anterior segments. First dorsal pore XIII/XIV. Spermathecal pores two pairs in VII/VIII, VIII/IX; VII, VIII with a pair of genital papillæ lying close to the spermathecal pores and behind the chætal line. Oviduct pore single. Sperm duct openings on papillæ, separated by 7 setæ; XVII, XVIII, XIX with a pair of genital papillæ behind the chætal line.

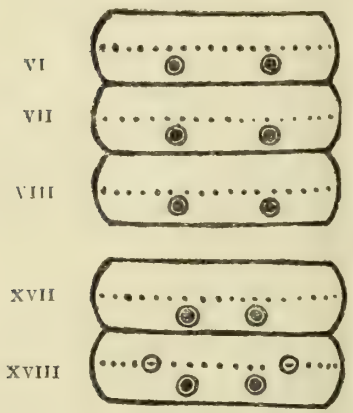
Intestine begins in XV; intestinal cœca one pair, in XXVI, large, extend-

ing for 4 segments anteriorly, and with the anterior end usually winding. Thickened septa V/VI—VII/VIII in front of the gizzard, and X/XI—XIII/XIV behind it; septa VIII/IX, IX/X wanting. Spermathecæ two pairs, in VIII, IX, with small diverticula, blind end enlarged. Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs two pairs in XIII, XIV, small. Prostate gland lobate, occupying XVII—XX. Last heart in XIII.

Loc.—Kamakura.

4. *P. kamakurensis*, n. sp.

Length of body 120 mm., breadth 6 mm., number of segments 79. Clitellum XIV—XVI, without setæ. Number of setæ in the spermathecal segments about 33. First dorsal pore XII/XIII. Spermathecal pores three pairs in V/VI, VI/VII, VII/VIII; VI, VII, VIII with a pair of genital papillæ behind the chætal line. Oviduct pore single. Sperm ducts opening on papillæ, the pores being separated by 10 setæ; one pair of genital papillæ on the same and the preceding segments behind the chætal line and inside the male pores.



Intestine begins in XIV; one pair of intestinal cæca in XXVII, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XII/XIII; no septa in VIII/IX, IX/X. Spermathecæ three pairs, in VI, VII, VIII, with diverticula. Testes in X, XI; sperm reservoirs in XI, XII, with the dorsal surface lobed. Ovary small; ovisacs in XIII. Prostate gland somewhat rectangular, with shallow furrows on the surface, small, extending through XVII, XVIII; sperm duct without any terminal bulb. Last heart in XIII.

Loc.—Kamakura, Tokyo.

5. *P. parvula*, n. sp.

Length 32 mm., breadth 2 mm., number of segments 48. Clitellum XIV—XVI, without setæ. First dorsal pore XI/XII. Spermathecal pores three pairs, in V/VI, VI/VII, VII/VIII; no genital papilla in this region. Sperm

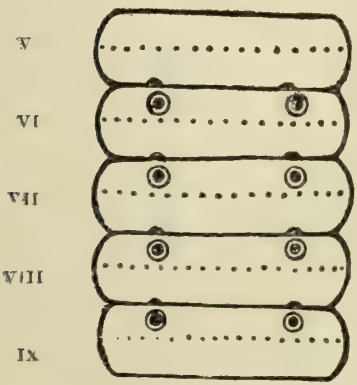
duct pores could not be observed; no genital papilla around them. Color of alcoholic specimens dusky.

Intestine begins in XVI; one pair of intestinal cœca in XXVIII, elongated, extending through four segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XV/XVI; septa VIII/IX, IX/X wanting. Spermathecæ three pairs, in VI, VII, VIII, without diverticula. Testes in X, XI; sperm reservoirs in XI. XII. Ovary comparatively large; ovisac absent. Prostate gland wanting. Last heart in XIII.

Loc.—Kamakura.

6. *P. heteropoda*, n. sp.

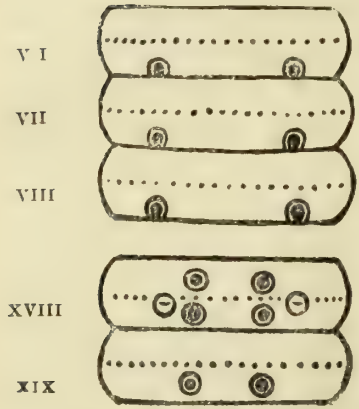
Length 100 mm., breadth 4 mm., number of segments 72; all the segments except the first and the last of the same breadth. Color brown, except the clitellum, which is yellowish. Clitellum XIV—XVI, without setæ. *Setæ of segments II—XIII thicker and longer;* their number in the spermathecal segments 32. First dorsal pore X/XI Spermathecal pores four pairs, in V/VI, VI/VII, VII/VIII, VIII/IX; VI, VII, VIII, IX, with a pair of genital papillæ *in front of the chætal line.* Sperm duct pores separated by 12 setæ; no genital papillæ in this region; margin of the pores slightly elevated.



Intestine begins in XVII; one pair of intestinal cœca in XXVI, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and *X/XI—XV/XVI;* septa VIII/IX, IX/X wanting. Spermathecæ 4 pairs, in VI, VII, VIII, IX, with diverticula which are not convoluted but with the blind end simply enlarged. Testes in X, XI; sperm reservoirs in XI, XII. Ovary large; ovisac absent; oviduct also large and very easy to observe. The two vasa efferentia unite near the septum XII/X II; *prostate gland absent; terminal bulb present* situated a little in front of the external male pore. Last heart in XIII.

Loc.—Tokyo, Tokorosawa (about 20 miles N.W. from Tokyo), Kamakura.

7. *P obscura*, n. sp.



Length 80 mm., breadth 4 mm., number of segments 76. Clitellum XIV—XVI, without setæ, not glandular and with the same appearance as the other segments ; *each clitellar segment with a transverse granulate ridge on the ventral side.* Number of setæ in the spermathecal segments 35—38. First dorsal pore X/XI. Spermathecal pores 3 pairs, in VI/VII, VII/VIII, VIII/IX, on top of papillæ directly in front of the intersegmental line.* Sperm duct pores separated by 14 setæ ; segment XVIII with two pairs of genital papillæ, one in front of chætal line and the other behind it ; segment XIX with one pair of similar papillæ behind the chætal line.

Intestine begins in XV ; one pair of intestinal cœca in XXVI, very small, extending for 2 segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIV/XV ; septa VIII/IX, IX/X wanting. Spermathecæ 3 pairs, in VII, VIII, IX, with diverticula, finger shaped and straight. Testes in X, XI ; sperm reservoirs in XI, XII. *No ovisac.* Prostate gland small, extending through only 2 segments, lobed, rectangular ; no terminal bulb on the sperm duct. Last heart in XIII.

Loc.—Kamakura.

8. *P. scholastica*, n. sp.

Length 155 mm , breadth 5 mm., number of segments 127. Clitellum XIV—XVI, without setæ. Number of setæ in the spermathecal segments 39—48, posterior to IX 48 in each ; in preclitellar segments the ventral setæ are larger than the dorsal, but in postclitellar segments they are all of the same size ; in the nine segments immediately in front of the clitellum as well as in

* In the upper portion of the accompanying cut the spermathecal openings have by oversight been represented like genital papillæ.

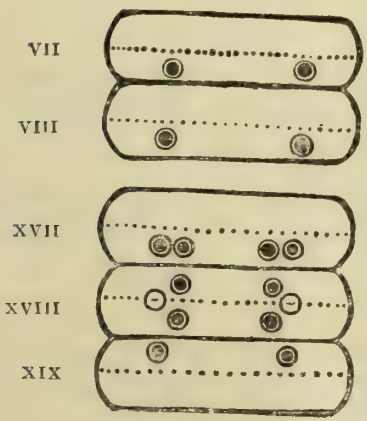
6—7 segments immediately behind it the chætal lines are more prominent and the intersegmental lines more distinct. Color of clitellum in alcoholic specimens brown, the rest grey Spermathecal pores 4 pairs, in IV/V, V/VI, VI/VII, VII/VIII; no genital papillæ in this region. Sperm duct pores separated by 8 setæ; genital papillæ wanting.

Intestine begins in XV; one pair of intestinal cœca in XXV, extending forwards as far as XXIII. Thickened septa VI/VII, VII/VIII and X/XI—XIV/XV; septa V/V, VIII/IX, IX/X absent. Spermathecæ 4 pairs, in V, VI, VII, VIII. In the single specimen of this species that has come under our observation only the spermatheca on the left side of VII was provided with a minute diverticulum; which is probably a departure from the rule. Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs two pairs, in XIII, XIV, very small. Prostate gland large, 2-lobed, *directly opening into the sperm duct without the mediation of a duct.* Last heart in XIII.

Loc.—Tokyo.

9. *P. decimpapillata*, n. sp.

Length 150 mm., breadth 4 mm., number of segments 115, of uniform breadth throughout. Clitellum XIV—XVI, without setæ. Number of setæ in the spermathecal segments 36. First dorsal pore XI/XII. Spermathecal pores 3 pairs, in V/VI, VI/VII, VII/VIII; VII, VIII with a pair of genital papillæ behind the chætal line. Sperm duct pores on papillæ, separated by 10 setæ; five pairs of genital papillæ in the vicinity, two pairs in XVII behind the chætal line, two pairs in XVIII inside the male pores, one in front of, and the other behind, chætal line, and one pair in XIX in front of the chætal line, those in XVIII being in a line with the inner pair of the preceding segment.



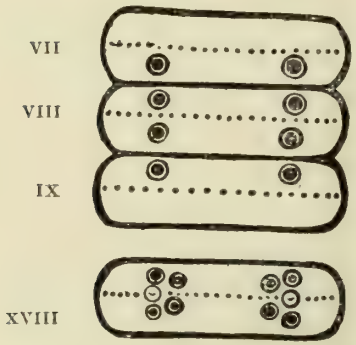
Intestine begins in XV; one pair of intestinal cœca in XXVI, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIII/XIV; septa VIII/IX, IX/X absent. Spermatheca 3 pairs, in VI, VII, VIII, *with very small diverticula.*

Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs one pair, in XIII. Prostate gland large, extending through 5 segments, XVI—XX, lobate. No terminal bulb on the sperm duct.

Loc.—Tokyo.

10. *P. flavescens*, n. sp.

Length 120 mm., breadth 6 mm., number of segments 126. Clitellum XIV—XVI, swollen, without setæ. Anal segment comparatively long Number of setæ in the spermathecal segments constant, viz. 20; these as well as the anterior segments with larger but fewer setæ than the posterior segments, which are provided with more but smaller setæ, there being 40—50 in each. First dorsal pore in XIII/XIV. Spermathecal pores 3 pairs, in VI/VII, VII/VIII, VIII/IX; VII with one pair of genital papillæ behind the chætal line, VIII with two pairs, one in front of, and the other behind, the chætal line, IX with one pair in front of the chætal line; there being 4 pairs in all in this region. Sperm duct pores on top of papillæ, separated by 7 setæ; 4 pairs of genital papillæ in XVIII, two external and two internal; the internal pairs lying inside the male pores, close to the chætal line, one in front of, and the other behind it; the external pairs are also situated in front and behind, but lie slightly external to the male pores; the papillæ around each male pore occupying the four corners of a trapezoid with the parallel sides parallel to the long axis of the worm and the shorter side turned inward.

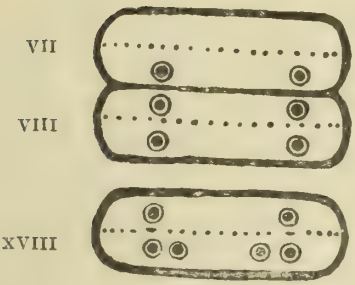


Intestine begins in XV; one pair of intestinal cœca in XXV, extending for three segments anteriorly. Thickened septa IV/V—VII/VIII and X/XI—XII/XIII; septa VIII/IX, IX/X wanting. Spermathecæ 3 pairs, in VII, VIII, IX, with large vesicular portions and short ducts; only the pair in VIII with minute diverticula. Testes in X, XI; sperm reservoirs in XI, XII. Ovisacs in XIII. Prostate gland large, occupying XVII—XIX, 2-lobed,

with shallow furrows on the surface. No terminal sac on the sperm duct. Last heart in XIII.

Loc.—Tokyo.

11. *P. producta*, n. sp.



Length 140 mm., breadth 6 mm, number of segments 120. Clitellum XIV—XVI, without setæ. Number of setæ in VI 30, in VII 35, in VIII 39, in IX 31, in the more posterior segments 40—45 ; preclitellar setæ large. First dorsal pore in XIII/XIV. Spermathecal pores 3 pairs, in VI/VII, VII/VIII, VIII/IX; genital papillæ three pairs, one pair in VII behind the chætal line, two pairs in VIII, one in front of, the other behind, the chætal line. Sperm duct pores slit-shaped and not opening on papillæ, therefore difficult to make out, separated by 8 setæ ; genital papillæ 3 pairs in XVIII, one pair in front of the chætal line, in a line with the male pores, and two pairs, internal and external, behind the chætal line, the external pair being in a line with the male pores.

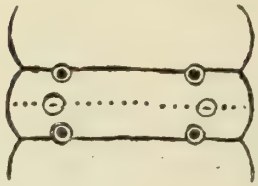
Intestine begins in XV ; one pair of intestinal cœca in XXV, extending for three segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIII/XIV ; septa VIII/IX, IX/X absent. Spermathecæ 3 pairs, in VII, VIII, IX, with large vesicular portions and short ducts, without diverticula. Testes in X, XI ; sperm reservoirs in XI, XII. Ovaries comparatively large; ovisacs small, in XIII, XIV. Prostate gland wanting ; no terminal bulb on the sperm duct. Last heart in XIII.

Loc.—Tokyo.

As cases of variation occurring in this species we may mention four specimens which differed from the above in the following respects : (1) clitellar segments with about 40 setæ, (2) number of setæ in the spermathecal segments 45, in III 30, in XX 48, (3) setæ small and of uniform size everywhere, (4) sperm duct pores on top of papillæ, and separated by 10 setæ. We think that these differences are hardly entitled to specific distinction.

12. *P. micronaria*, n. sp.

Length 66 mm., breadth 3 mm, number of segments 106. Clitellum XIV—XVI, without setæ. Number of setæ in the spermathecal segments 28-32, more posteriorly 35. First dorsal pore in XI/XII. Spermathecal pores 4 pairs in V/VI—VIII/IX; *no genital papillæ in this region.* Sperm duct pores large, on top of papillæ, separated by 8 setæ; two pairs of genital papillæ in XVIII just inside the lines of the male pores, each pair close to the intersegmental lines.

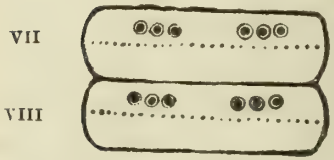


Intestine begins in XV; one pair of intestinal cœca in XXVI, extending for two segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XII/XIII. Spermathecæ 4 pairs, in VI—IX; only the pair in VIII with minute diverticula. *No ovisac.* Prostate gland in XVII—XX. Testes in X, XI; sperm reservoirs in XI, XII, comparatively small. Last heart in XIII.

Loc.—Tokyo.

13. *P. vittata*, n. sp.

Length 100 mm., breadth 6 mm., number of segments 68. In the dorsal aspect, the chætal lines are light grey and the rest dark brown, thus appearing banded; in the ventral view of uniform light grey. Clitellum flesh-red, XIV—XVI, without setæ. Number of setæ in III 35, in VII 57, in VIII 59, in XVIII 60. First dorsal pore in XIII/XIV. Spermathecal pores 6 *pairs, on top of papillæ, 3 pairs in both VII and VIII, those of the same segment being situated in the same transverse line and in front of the chætal line.** Sperm duct pores could not be detected externally.



Intestine begins in XVI; one pair of intestinal cœca in XXVI, *with five secondary cœca,* of which the most dorsal is longest and the more ventral ones gra-

* The punctated circles in the accompanying cut represent the spermathecal openings and not genital papillæ, as might be inferred from analogy with other cuts.

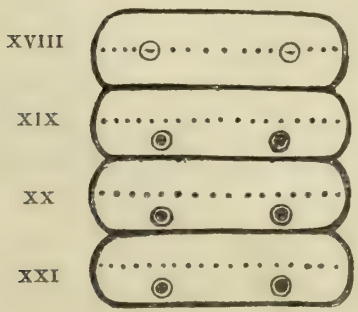
dually become shorter. Thickened septa V/VI—VII/VIII and X/XI—XV/XVI. Spermathecæ 6 pairs, three in VII and three in VIII, without diverticula. Testes in X, XI ; sperm reservoirs in XI, XII, very small, only the dorsal edges projecting on either side of the intestine. Ovaries as well as ovisacs comparatively large, in XIII. The two vasa efferentia unite in XII ; the vas deferens can be traced sometimes as far back as XVIII or more backwards, the extremity being usually club-shaped. Last heart in XIII.

Loc.—Tokyo, Kamakura.

Among the numerous specimens of this species that have come under our observation two presented the following points of variation : (1) first dorsal pore in XII/XIII, (2) spermathecæ only in VIII, and the pores neither on top of papillæ nor *in* the segment but in the intersegmental line between VII and VIII.

14. *P. grossa*, n. sp.

Length 240 mm., breadth 8 mm., number of segments 141. Near the two ends of the body the chætal lines are more prominent and the intersegmental lines more distinct. Clitellum XIV—XVI, without setæ. Number of setæ in the spermathecal segments 53-57, in the more posterior segments 60-70. First dorsal pore in XIII/XIV. Spermathecal pores 4 pairs, in V/VI-VIII/IX ; no genital papillæ around them. Sperm duct pores on top of papillæ, separated by 9 setæ ; XIX, XX, XXI each with a pair of genital papillæ behind the chætal line.



Intestine begins in XV ; one pair of intestinal cæca in XXVI, very long, extending for 6 segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIV/XV ; septa VIII/IX, IX/X wanting. Spermathecæ 4 pairs, in VI, VII, VIII, IX, with tubular, convoluted diverticula longer than the pouches. Testes in X, XI ; sperm reservoirs in XI, XII ; both testes and the reservoirs large. Ovary large ; no ovisac. Prostate gland lobate, in XV—XIX. Last heart in XIII.

Loc.—Kawaguchi (Prov. Kai).

15. *P. schizopora*, n. sp.

Length 78 mm., breadth 4 mm., number of segments 96. Clitellum XIV—XVI, without setæ, but with distinct intersegmental lines and with the same color as the rest of the body. Setæ fewer in the anterior segments, 33 in III, 44 in IV, 53 in V, and thereabout in the more posterior segments. First dorsal pore in XII/XIII. Spermathecal pores one pair, in VII/VIII, distinct and slit like, with a slightly elevated margin. *Oviduct pores one pair*, the two being separated by about 1 mm. Sperm duct pores could not be observed. No genital papilla anywhere.

Intestine begins in XV; 5 pairs of intestinal cœca in XXVI, the most dorsal pair being longest, and thence decreasing towards the ventrum. Thickened septa V/VI—VI/VII and X/XI—XIV/XV; in VII/VIII there are a few oblique muscles but no distinct septum; septa VIII/IX, IX/X absent. Spermathecæ one pair, in VIII. In the single specimen observed, the spermatheca of the left side had *three diverticula*, two of which were shorter than the pouch and had vesicular extremities, while the third was long and finger-shaped; the spermatheca of the right side had only one finger-shaped diverticulum; that of the left side probably represents the normal condition. Testes in X, XI; sperm reservoirs in XI, XII, very small. Ovisacs in XIII. No special feature about the oviducts except that *they are entirely separate*. No prostate gland; the sperm duct can be traced only as far as XIV. Last heart in XIII.

Loc.—Tokyo.

16. *P. Takatorii*, n. sp.*

XVIII 

Length 314 mm., breadth 8 mm., number of segments 120. Ventral and dorsal sides very different in color, the former being yellowish brown and the latter light grey. Clitellum XIV—XVI, without setæ, of

* Dedicated to Mr. Y. Takatori of the Agricultural Department of the Government of Formosa, whose kindness in complying with our request to collect and send earthworms is here gratefully acknowledged. We owe this as well as the next following species to him.

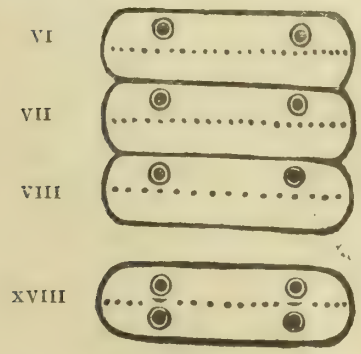
uniform light yellow. Number of setæ fewer in the anterior segments; in the spermathecal segments 51, behind them about 65. First dorsal pore in XI/XII. Spermathecal pores two pairs, in VII/VIII, VIII/IX; with two or three genital papillæ on the posterior margin of the next preceding segment. Sperm duct pores on top of papillæ, each surrounded by 8 genital papillæ arranged by fours on the two sides of an isosceles triangle with the base turned externally.

Intestine begins in XV; one pair of intestinal cœca in XXVI, extending for 3 segments anteriorly. Thickened septa V/VI—VII/VIII and X/XI—XIII/XIV; septa VIII/IX, IX/X wanting. One pair of spermathecæ in VIII, with two finger-shaped, more or less winding diverticula of unequal lengths, and another pair of similar spermathecæ and three pairs of small accessory spermathecæ without diverticula in IX; the accessory spermathecæ being situated internally to the well-developed ones. Testes in X, XI: sperm reservoirs in XI, XII. Ovisacs in XIII. Prostate glands lobate, in XVII—XXI. Last heart in XIII.

Loc.—Taipei-fu (Northern Formosa).

17. *P. candida*, n. sp.

Length 150 mm, breadth 6 mm., number of segments 95. Color dark brown on the dorsal side, light grey on the ventral side, and the two colors meeting in a line on the lateral side; with metallic lustre; chætal lines faintly white. Clitellum XIV—XVI, without setæ. Setæ somewhat widely separated from each other; in II there were 20 setæ, in III 32, in IV 34, in VII 44, in VIII 46, in XVIII 44. First dorsal pore in XIII/XIV. Spermathecal pores two pairs, in VI/VII, VII/VIII; one pair of genital papillæ in front of the chætal line in VI, VII, VIII. Sperm duct pores separated by 12 setæ; two pairs of genital papillæ directly inside the male pores, one on either side of the chætal line.



Gizzard in IX—X; intestine begins in XV; one pair of intestinal cœca in XXVII, extending for two segments anteriorly. Thickened septa VI/VII—

VIII/IX and X/XI—XIII/XIV ; septa IX/X, X/XI wanting. Spermathecæ two pairs, in VII, VIII, with diverticula more than 3 times as long as the pouches. Testes in X, XI ; sperm reservoirs in XI, XII. No ovisac. Prostate gland large, lobate, in XVII—XXII ; terminal portion of the sperm duct S-shaped. Last heart in XIII.

Loc.—Taipei-fu (Northern Formosa).

The principal characters of the species here described are summarised in the a ljoined table.

Printed September 30th, 1898.

	Length mm.	Breadth mm.	No. of segments.	Setæ in spermath segment.	Setæ between male pores.	Clitellum.	Genital papillæ.	Spermathecæ.	Ist. dorsal pore.	Last heart.	Recept. ovorum.	Prostate.	Termin. sac.	Gizzard.	Commenc intestine.	intestinal cœca.	Thickened septa.
P. fuscata.	150	5	110	24—35	9	XIV—XVI.	V, VI, VII, XVII, XVIII, XIX.	V, VI. VII.	XIII/XIV.	XIII.	XIII, XIV.	XVIII.	0	VIII—IX.	XV.	XXVII.	V/VI—VII/VIII, X/XI—XII/XIII.
P. campestris.	120	6	77	35	7	XIV—XVI.	VI VII,XVII,XVIII,XIX	VI, VII, VIII.	XII/XIII.	XIII.	XIII, XIV.	XVIII.	0	VIII—IX.	XV.	XXVI.	V/VI—VII/VIII, X/XI—XIII/XIV.
P. kamakurensis.	120	7	79	33	10	XIV—XVI.	VI, VII, VIII. XVII, XVIII.	VI VII, VIII.	XII/XIII.	XIII.	XIII.	XVIII.	0	VIII—IX	XIV.	XXVII.	V/VI—VII/VIII X/XI—XII/XIII.
P. parvula.	32	2	48	24	0	XIV—XVI.	0	VI, VII, VIII.	XI/XII	XIII.	0	0	0	VIII—IX	XV.	XXVIII.	V/VI—VII/VIII, X/XI—XV/XVI.
P. heteropoda.	100	4	117	32	12	XIV—XVI.	VI, VII, VIII, IX.	VI, VII, VIII, IX.	X/XI.	XIII	0	XVIII.	Pusent	VIII—IX.	XVII.	XXVI.	V/VI—VII/VIII. X/XI—XV/XVI.
P. obscura.	80	4	76	36—37	14	XIV—XVI.	XVIII, XIX.	VII, VIII, IX.	X/XI.	XIII.	0	XVIII.	0	VIII—IX	XV.	XXVI	V/VI—VII/VIII, X/XI—XV/XVI.
P. scholastica.	155	5	127	39—48	8	XIV—XVI.	0	V, VI, VII, VIII.	XIII/XIV.	XIII.	XIII, XIV.	XVIII	0	VIII—IX.	XV.	XXV.	VI/VII—VII/VIII, X/XI—XIV/XV.
P. decimpapillata.	150	4	115	36	10	XIV—XVI.	VII, VIII, XVII, XVIII, XIX	VI, VII, VIII.	XI/XII.	XIII.	XIII.	XVIII.	0	VIII—IX.	XV.	XXVI	V/VI—VII/VIII, X/XI—XIII/XIV.
P. flavescens.	120	6	126	20	7	XIV—XVI.	VII, VIII, IX, XVIII.	VII, VIII, IX.	XIII/XIV.	XIII.	XIII.	XVIII.	0	VIII—IX.	XV.	XXV.	IV/V—VII/VIII, X/XI—XII/XIII.
P. producta.	140	6	120	35—39	8	XIV—XVI.	VII, VIII, XVIII.	VII, VIII, IX.	XIII/XIV.	XIII.	XIII, XIV.	0	0	VIII—IX	XV.	XXV.	V/VI—VII/VIII, X/XI—XIII/XIV.
P. micronaria.	55	3	102	28—30	8	XIV—XVI.	XVIII, XIX.	VI, VII, VIII, IX.	XI/XII.	XIII.	0	XVIII.	0	VIII—IX	XV.	XXVI.	V/VI—VII/VIII, X/XI—XII/XIII.
P. vittata.	120	6	68	57	0	XIV—XVI.	0	VII, VIII.	XIII/XIV.	XIII.	XIII.	0	0	VIII—IX	XVI.	XXVI.	V/VI—VII/VIII, X/XI—XII/XIII.
P. grossa	240	8	141	53—57	9	XIV—XVI.	XIX, XX, XXI.	VI, VII, VIII, IX.	XIII/XIV.	XIII.	0	XVIII.	0	VIII—IX	XV	XXVI.	V/VI—VII/VIII, X/XI—XIV/XV.
P. schizopora.	78	4	96	53	0	XIV—XVI.	0	VIII.	XII/XIII.	XIII.	XIII.	0	0	VIII—IX.	XV.	XXVI	V/VI—VI/VII, X/XI—XIV/XV.
P. Takatorii.	314	12	120	51	8	XIV—XVI.	XVIII.	VIII, IX.	XI/XII.	XIII.	XIII.	XVIII.	0	VIII—IX.	XV	XXVI.	V/VI—VII/VIII. X/XI—XIII/XIV.
P. candida.	150	6	95	44—46	12	XIV—XVI.	VI, VII, VIII, XVIII.	VII, VIII.	XIII/XIV.	XIII.	0	XVIII.	0	IX—X.	XV.	XXVII.	VI/VII—VIII/IX, X/XI—XIII/XIV.

THE BODY-CAVITIES OF THE STAR-FISH.

By SEITARO GOTO.

First High School, Tokyo.

In a paper on the metamorphosis of *Asterias pallida* (1) published a short while ago I have come to conclusions, which are in several respects contradictory to those arrived at by others from a study of other species. In particular, my results, while confirming those of MacBride (2) in many essential points, could not at the same time be reconciled with them in several not unimportant details. To see if these differences are to be explained by the principle of personal equation or are really due to differences of species I obtained some material of *Asterina gibbosa* from the Zoological Station of Naples and have made a close comparison with the species formerly studied by me. The result was that, while the embryological differences of the two species are not so great as might be inferred from a comparison of the published accounts, yet are in some respects decidedly conspicuous.

The enterocœl of an adult star-fish consists, aside from the axial sinus and some other smaller cavities, of two compartments entirely separated from each other by a continuous and somewhat complicated mesentery, one lying on the aboral side of the gut and the other mostly on the oral side. The former I have called the *epigastric* enterocœl, and the latter may be called the *hypogastric* enterocœl. In this paper I shall, in the first place, describe the relation of these two cavities to the larval body-cavities in *Asterina gibbosa* and compare it with what obtains in *Asterias*, and then treat of some of those accessory cavities above referred to; confining our attention to general features and reserving the details for another paper accompanied by plate, to be shortly published in the Journal of the College of Science, Imperial University of Tokyo.

The various entercœlic cavities that arise during development and their genetic relations to the four portions of the larval entercœl in *Asterias pallida* may be diagrammatically represented as follows:

Right Anterior Ent'c'l.... Right Ant. Ent'c'l. } Ant. Ent'c'l.=**Axial Sinus.**

Left Anterior Ent'c'l..... { Left Ant. Ent'c'l. **Hydrocœl.**

Right Posterior Ent'c'l.... { **Epigastric Ent'c'l.** ½ Right Post. Ent'c'l... } Secondary Left Post. Ent'c'l. } **Hypogastric Ent'c'l.**

Left Posterior Ent'c'l..... { Left Post. Ent'c'l. ..... Periœsophageal Ent'c'l ..... **Dorsal Sac.**

As an explanation of this diagram the following may be added. The two anterior enterocœls unite at a very early stage, and the hydrocœl is formed from the left enterocœl at about the same stage. The united anterior cavities remain in the adult animal as the axial sinus. The two posterior enterocœls unite on the ventral side, but very soon about one-half of the right posterior enterocœl is cut off from the rest by the formation of a secondary septum; this is the epigastric enterocœl. The remaining single cavity is what I have called the secondary left posterior enterocœl, and is destined to form a large portion of the hypogastric enterocœl. The periœsophageal enterocœl is budded out from the left posterior enterocœl after its union with the right. The dorsal sac also arises from the left posterior enterocœl, but at a very early stage. The cavity whose names are printed in full-face are those that persist in the adult star.

Turning now to *Asterina gibbosa* we see that the epigastric enterocœl is formed by a precisely similar process as in *Asterias*. MacBride (2) calls it "right posterior" enterocœl, as does Bury for *Bipinnaria asterigera* (3); but careful observation shows that it is something quite different from the right posterior enterocœl of the larva. It is true that on the right side there is no natural boundary line between the anterior and posterior enterocœls, but I think there is no valid objection to the criterion I adopted in my paper on *Asterias*, viz. to regard the transverse plane passing through the pore-canal as the boundary line between the two enterocœls, the anterior and posterior. With this criterion in mind, if we look on the right side of a larva of *Asterina gibbosa* in about stage D of MacBride it is very plain that the mesentery separating the "right posterior" enterocœl of MacBride runs very obliquely from the postero-ventral corner of the larva anteriorly towards the pore-canal. This obliquity of the course of the mesentery was observed long ago by Ludwig, and is correctly represented in several of his figures (4, figs. 31 and 32). Again, the accompanying cut, which represents the ventral portion of a transverse section through the region under consideration of a

larva in an intermediate stage between stages C and D of MacBride, proves the same fact still more conclusively. Here one sees the primary mesentery dividing the left posterior from the right posterior enterocœl still persisting but considerably thinned out, while at a short distance from it on the right side there has been formed a second septum by the apposition of the peritoneal walls. The primary mesentery subsequently ruptures and leaves no trace, while the secondary septum is gradually completed and finally becomes a true mesentery by ingrowth of the mesenchyme and the consequent separation of the two secondarily formed cavities. The one lying entirely on the right side is the epigastric enterocœl, and the other lying mostly on the left side and extending on to the ventral side is the secondary left posterior enterocœl. It is evident from what has been said that the latter is equal to the left posterior enterocœl of the larva plus about one-half of the right posterior enterocœl of the same. This is also true of *Asterias pallida*.

a epigastric enterocœl, *b* portion of the right posterior enterocœl cut off from the rest, *c* left posterior enterocœl.

The circular enterocœl and a portion of the perihæmal system arise in *Asterina gibbosa* in a very different way from what takes place in *Asterias pallida*. According to MacBride the entire perihæmal system of authors, viz. the circular enterocœl plus the perihæmal system of the present writer, arises in the form of five interradial out-pocketings of the secondary left posterior enterocœl. According to my observations there are only four interradial out-pocketings from the secondary left posterior enterocœl, viz. in interradii 4-5, 2-3, 3-4, and 5-1.* In interradius 1-2 the out-pocketing is replaced by the axial sinus (anterior enterocœl). The four out-pocketings, after being completely divided off from the secondary left posterior enterocœl, grow towards, and unite with, each other and with the axial sinus, and forms a complete ring. This ring is subsequently divided into two concentric portions by the formation of a septum; these are the two perihæmal ring-spaces of authors. Before the formation of this secondary septum, however, the peripheral portions of the four out-pocketings and the oral portion

* Adopting MacBride's notations.

of the axial sinus grow outwards (i.e. towards the periphery of the disc) in two horns, which again grow in, each towards the next adjoining radius and there become apposed to similar horns from the next interradii. These horns lying in the radii unite with the other portions of the perihæmal system, which have a quite different origin.

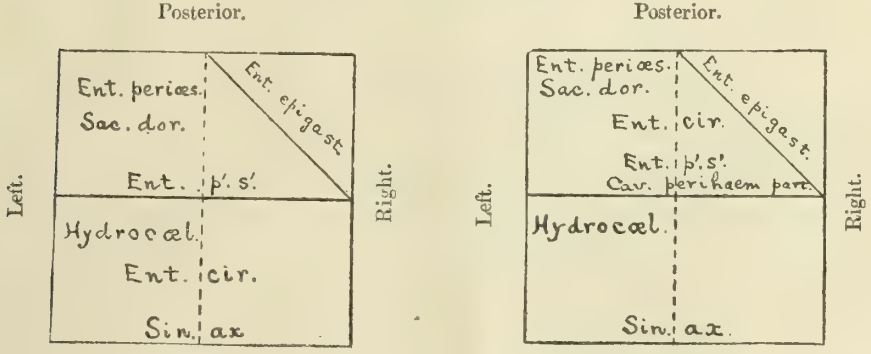
The portions of the perihæmal system lying peripherally from within the first pair of tube-feet arise in *Asterina gibbosa* in exactly the same way as the entire system does in *Asterias pallida*, viz. as separate solid masses of mesenchymatous cells lying in pairs on the oral side of the radial water-vascular tubes, between the successive pairs of tube-feet. These solid masses subsequently acquire lumen and growing towards each other unite. The radial septum, i.e. the septum between the members of each pair, is never absorbed. This would seem to reduce our conception of the origin of the perihæmal system to chaos, but in the face of observed facts we should only wait for a higher generalisation to bring harmony into the subject. It may be added that we have parallel cases in other groups, where the same organ arises differently in different species (collar-cavity in Enteropneusta, certain organs in the bud-development of ascidians).

In conclusion I must refer to the so-called "dorsal sac." MacBride claims to have proved the origin of this organ from the right anterior enterocœl, and he therefore regards it as the homologue of the hydrocœl on the left side and calls it the "right hydrocœl." To support his opinion he refers to certain abnormal larvæ in which there were pore-canals on both sides of the body, the one on the right side opening into the supposed right hydrocœl. I have not had the good fortune of coming across any similar abnormality; but the observation of normal larvæ has led me to a very different conclusion, entirely confirmatory of my observation on *Asterias*.

The cavity in question arises in fact from the anterior end of the left posterior enterocœl. Its right end is closely apposed to the wall of the right posterior enterocœl, as in *Asterias*, but there is at no time any connection between the two. Its origin from the left posterior enterocœl is, on the contrary, very distinct and unmistakable. The series of sections that I shall reproduce in my full paper will, I think, put the matter beyond doubt. MacBride's idea of the homology in question is thus entirely deprived of its ground.

The differences above sketched between *Asterias pallida* and *Asterina gibbosa*

may be shown by the adjoined cuts, in which the four smaller squares represent the four portions of the larval enterocœl. The broken lines represent the partitions, real or imaginary, that obtain in the larva, and full lines the partitions that obtain in the adult. The names of the different cavities are written within the parts of the larval enterocœl from which they arise.



Ent. periœs.	Pericœsophageal enterocœl
Ent. cir.	Circular enterocœl.
Ent. epigast.	Epigastric enterocœl.
Ent. p' s'.	Secondary left posterior enterocœl.
Cav. perihæm part.	Perihæmal cavities partly.
Sin. ax.	Axial sinus.

It may be added that this diagram may be directly derived from nature by viewing the larva from the ventral side and supposing the body to be cut open in the dorsal mid-line and spread out flat, and imagining the larval enterocœls as squares.

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Printed September 30th, 1898.

ON A NEW RHIZOPOD PARASITE OF MAN (AMŒBA MIURAI N. SP.)

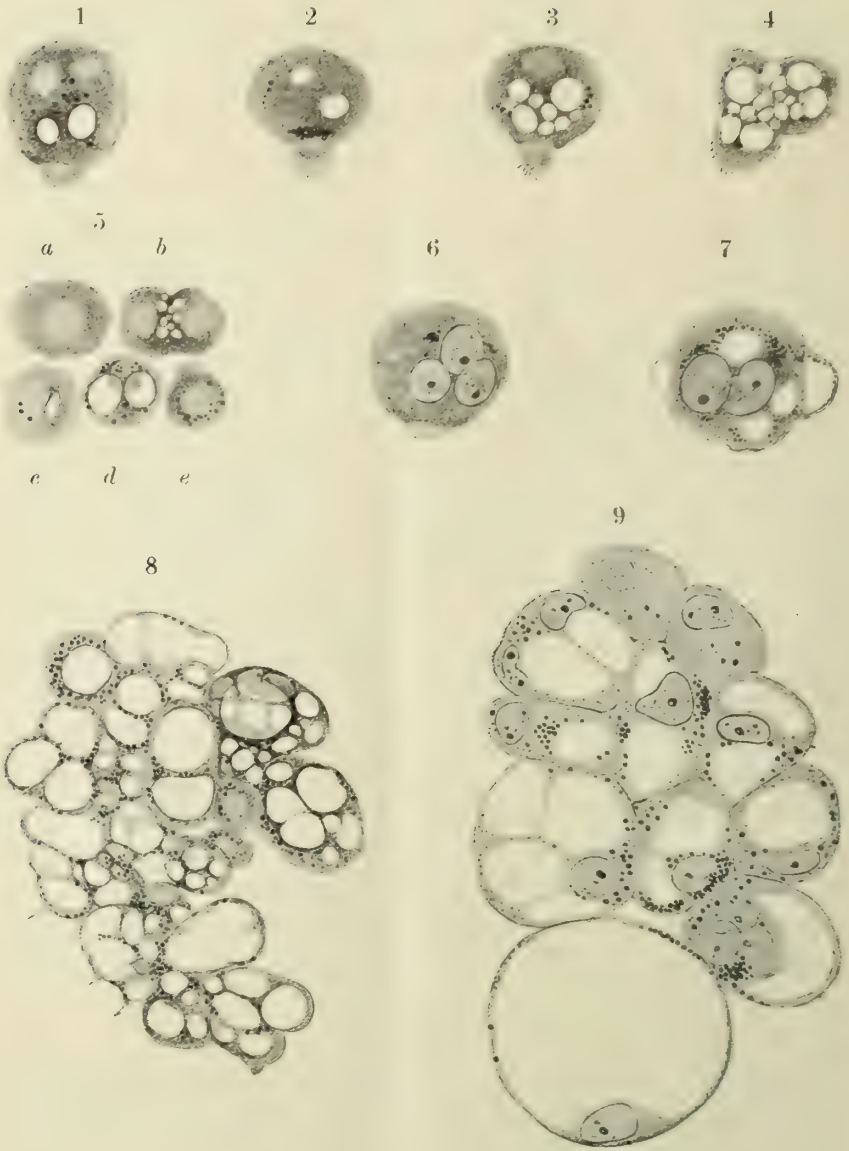
By Prof. I. IJIMA, Ph. D.

The Rhizopod parasite of man, reported on in this paper, apparently represents a hitherto undescribed species of Amœbæa. I take pleasure in proposing to call it *Amœba miurai* after Prof. K. MIURA of the Medical College, Imperial University of Tokyo, who first discovered it and kindly handed over to me the materials for study and description. The patient, who harbored the parasite, was a married woman, Yuki Ishiwatari by name and twenty-six years of age. She resided in the Prefecture of Kanagawa until she was taken into the University Hospital at the end of November last year. Her disease consisted at first in abdominal tumors which could be felt from outside andin ascites-like accumulation of fluid in the abdominal cavity. Later the affliction increased the degree of malignance and extended itself into the left pleural cavity. The patient finally succumbed in August of the present year. As the result of clinical and post mortem examinations Prof. MIURA has arrived at the conclusion, that he had to do with a case of *peritonitis* and *pleuritis endotheliomatosa*. For the details of this case from medical standpoint I refer those interested to a forthcoming paper of Prof. MIURA himself, which will appear in the "Mittheilungen aus der medicinischen Facultät der Kaiserlichen Universität zu Tokyo."

It was in the serous fluid-accumulation of the peritoneal as well as of the pleural cavity that the Amœbæ were found in abundance. Only during a period of about two days, shortly before the patient's death, they were also present in the fæces concomitantly with hæmorrhage in the intestine; at other times the fæces were free of them.

The discovery reminded us at once of *Leydenia gemmipara* Schaudinn, a human parasitic Rhizopod discovered two years ago in Berlin under almost identical circumstances.* However, it was evident without going into discriminating

* v. Leyden and Schaudinn: Sitz ber. d. k pr. Akad. d Wiss. Berlin, 1895, XXXIX.



Amœba miurai Ij.

All figures magnified 500 times. Figs. 1—5 and 8 drawn from fresh state; figs. 6, 7 and 9, after treatment, with acetic acid.

Fig. 1.—A living specimen, with the surface in slow wave-like motion. Below, the villous knob beset with short pseudopodia. Internally, two vacuoles with sharp contour, two nuclei represented by ill-defined clear spaces and a few oil-like corpuscles.

comparisons that the present Amœba represents a form quite distinct from the one just mentioned.

The serous fluid, obtained from time to time by repeated punctures, was always of the same nature and appearance, well agreeing with v. LEYDEN's account (loc. cit.) of the ascites-fluid in which *Leydenia gemmipara* was found. It was of a dark-reddish color on account of a large proportion of the blood it contained. When left standing for a few hours in a vessel, it separated into a serum of yellowish colour with greenish fluorescence and a thick sediment of dark-red color. The latter, when examined under the microscope, revealed the usual elements of a blood-coagulum (red and white blood-corpuscles, fibrin net-work) besides a variable number of what appeared to be endothelial cells in the process of fatty degeneration and a multitude of peculiar bodies, the Amœba to be presently described (*vide* annexed half-tone cuts).

These were by no means uniform in appearance. While some showed a very characteristic shape and were evidently alive, others were abnormally vacuolated more or less swollen and apparently dead or nearly so. It is a noteworthy fact that both dead and living specimens were found together even in the fluid examined on warm stage immediately after extraction.

Individuals in living and consequently normal state (figs. 1—3) were found always isolated, never adhering together in clusters. The body of such is habi-

Fig. 2.—Same as above, the pseudopodia on the knob extended filament-like. Nucleus not visible. Vacuoles and oil-like corpuscles as in fig. 1.

Fig. 3.—Another living specimen, in which the villous knob is bounded against the main body by a shallow ring-groove. Several vacuoles within; above these the nucleus is indicated by the clearer appearance of the sarcode.

Fig 4.—A fresh specimen in the first stage of becoming morbid, but still showing some pseud podia. The knob bearing the latter is being encroached upon by the vacuoles which are enlarging themselves by imbibition.

Fig. 5.—Small, probably young specimens. *a*, with uneven surface; neither vacuoles nor oil-like corpuscles present, but with nucleus indistinctly recognizable at centre. *b*, biscuit-shaped and the two nuclei so disposed as if in process of cell-division; several small vacuoles and a few oil-like corpuscles at the middle. *c*, the surface uneven and with pseudopodia-like processes; a single small vacuole and a scanty number of oil-like corpuscles present. *d*, spherical, with three vacuoles and a fair number of oil-like corpuscles In all the above figures the villous knob is either concealed from view or not developed at all. *e*, with unmistakeable knob but without villi or pseudopodia; no vacuole; numerous oil-like corpuscles around the nucleus.

Fig. 6.—A specimen treated with dilute acetic acid solution. Pseudopodia on the knob retracted; three nuclei made distinctly visible; no vacuole.

Fig. 7.—A similarly treated specimen with two nuclei. The knob is either concealed or obliterated. The vacuoles have lost sharpness of contour. The accumulation of imbibed fluid has caused the pellicle to heave up, pustule-like, at several places.

Fig. 8.—Portion of a large mass formed by the cohering together of dead, strongly vacuolated individuals. Seen in fresh state.

Fig. 9.—A similar cluster of dead individuals, seen after treatment with acetic acid (greatly swollen but nuclei made distinct).

tually spherical or more frequently ellipsoidal, characterized by having at one pole a small rounded protuberance, which on close observation is found to bear on its surface a number of fine processes, the pseudopodia, closely set and extended to a greater or less degree. The protuberance is apparently the same structure as the "villous knob" or "Zottenanhang" which has long been known to characterize the hind end of certain species of Amœbæa (*Amœba villosa* Wallich, *Am. fluida* Gruber, *Pelomyxa villosa* Leidy).*

The size of the body is variable within certain limits. Large specimens have a diameter of 38 μ, while the smallest may measure not more than 15 μ across. They never attain the size of *Am. fluida* (80—90 μ, according to Greeff), which, of all the Amœba species known to me seems to come nearest to the present one in several respects.

The sarcode is, apart from its enclosures, clear and uniformly finely granular, without perceptible differentiation into the ectoplasm and the endoplasm except at the villous knob. The substance of the latter is clearer and hyaline, without enclosures of any kind. I think I may say that it represents the main, if not the entire, mass of the ectoplasm of the present species, localized as it were at the spot in question. This view also coincides with the fact that the general surface never involves itself in any considerable movements.

The villous knob may be papilliform or hemispherical in shape, measuring about 10 μ across at the base. At other times it is only a gentle elevation and under certain circumstances, may even be entirely retracted or obliterated. On small specimens, such as represented in fig. 5 *a—d*, I have frequently missed the knob. It is possible that in some of such cases it was simply concealed from view, being situated at a position turned away from or towards the sight; in certain other cases however I was convinced of its absence. In these latter cases, short

* *Am. villosa* is a fresh-water species first discovered and described by Wallich in England (Ann. & Mag. Nat. Hist. 1863). Whether the forms reported under the same name by Leidy (Fresh-water Rhizopods of N. America, 1879) and by Möbius (Rhizopodenfauna der Kieler Bucht; Abh. d. k. pr. Akad. d. Wiss. zu Berlin, 1888) were correctly identified, seems to require corroboration.—*Am. fluida* is a marine species first described by Gruber (Z. f. w. Z. Bd. 41, p. 219) and later more precisely by Greeff (Biol. Centralbl. Bd. 12, p. 374). This is a species that seems most to resemble *Am. miurai*.—*Pelomyxa villosa* was described by Leidy in his "Fresh-water Rhizopods of N. America," p. 75.—All these species have in common with *Am. miurai* the characteristic villous knob, though it can not be said that this structure is strictly confined to the species mentioned. As to the specific distinction between *Am. miurai* and the three species above cited let it suffice to mention here that the latter are all much larger in size, are capable of active, typically amœboid or flowing motion with the main body and inclose in the endosarc crystals, pigments or peculiar bodies such as are not observed in *Am. miurai*.

villi-like pseudopodia were sometimes found emanating in irregular distribution from the general surface (fig. 5, *a* & *c*), what might be expected to occur in immature individuals so long as these would be naked and the ectoplasm not concentrated into a knob.

It sometimes happens in life that the villiform pseudopodia are entirely retracted. The knob then presents a smooth surface (fig. 5, *e*), as it does always when acted upon by reagents (fig. 6). Otherwise it is beset with shorter or longer pseudopodia as the case may be. When short, the pseudopodia are generally conical in shape and comparatively thick though minute (fig. 1). By focussing up and down the microscope, it was easy to observe the knob-surface closely studded over with them. When fully extended (fig. 2), they may reach 5 μ in length and are extremely fine, broadest at base and thinned out towards end. They then seem to radiate forth in tolerably straight course. Although I do not remember having ever seen them branch or anastomose, yet I do not feel myself sufficiently warranted to exclude the possibility of such occurrence. The actual movement of the pseudopodia, whether molecular or otherwise, could not be watched in continuous succession, what is sufficiently accounted for by the slowness of motion combined with the fineness and the hyaline nature of the pseudopodia. On the other hand, by examining the same living object at intervals of several minutes, I could plainly observe, under favorable circumstances, the variation in the degree of contraction or elongation of the filamentous structures under consideration,— evidence enough that these are to be seen in the light of pseudopodia and not of immobile villi. The same view has been put forward by GREEFF* for the identical structures of *Am. fluida*.

The so-called villous knob passes usually, though not always, insensibly into the main body. Not unfrequently, however, there were cases in which the two parts were separated externally by a tolerably sharp line of demarcation (fig. 3). This was brought about by the presence of a shallow ring-groove surrounding the basis of the knob. The appearance then is as if either the knob-base has just slightly sunk into the main body or the latter has elevated itself in a low wall around the former. This is without doubt only a temporary condition arising from a certain state of contraction of the sarcode.

* GREEFF: Biol. Centralbl. Bd. XII, p. 377.

To all appearance the villous knob is naked, i.e., devoid of an external enveloping membrane The same can not be said of the main body. An indubitable, double-contoured membrane is indeed not directly demonstrable in either fresh or prepared specimens under ordinary circumstances. The contour-line of the main body appears sharp but is simple. Nevertheless, it often happens after death that the entire Amœba is blown out into a thin-walled vesicle by the excessive enlargement of the vacuoles contained, then to remain in that state for a considerable length of time, giving an impression as if the tension of a special superficial layer resisted its speedy bursting. Again, should the animal be left for some time in a dilute solution of acetic acid, the fluid imbibed into the sarcode frequently accumulates itself in the form of vacuoles just under the surface and heaves up from below a pellicle in a pustule like manner (fig. 7). These appearances have led me to infer that a thin elastic layer of a firmer consistency than the internal sarcode covers the whole surface, interrupted only at one spot by an opening through which the pseudopodia-producing ectoplasm is protruded knob-like into the exterior. This would be exactly the same state of things as has been described in certain near allies of the present species, e. g., in *Amœba fluida* by GREEFF,* in the genus *Hyalophrys* by ARCHER† and PENARD‡, a condition that leads over to that seen in the soft-shelled, monothalamous and monostomatous Rhizopods. In *Am. fluida* the membrane should be thicker and more distinct than in the present species.

The main body is not altogether incapable of changing its form but unlike its known nearest allies *Am. villosa* and *Am. fluida*, the motion is so slow and limited in extent that it requires close observation to perceive it. The shape may change from spherical into ellipsoidal or *vice versâ* and at times assume a somewhat irregular outline. In one case I have observed a slow wave-like movement of the surface, so that the latter presented a slightly verrucose appearance (fig. 1). A "flowing" motion of the sarcode or such active transformation of the body into lobate pseudopodia as is ascribed to *Am. villosa* or *Am. fluida*, was never noticed. On the contrary, the various enclosures retained tolerably constant relative positions all the while during observation. It seemed as if the

* GREEFF: loc. cit., p. 375.
† ARCHER: Quart. Jour. Micr. Sci. Vol. XI.
‡ PENARD: Mém. Soc. Physiq. H. N. Genève, T. XXXI, No. 2.

sarcode were not of sufficiently fluid nature as to allow of a far-reaching change in the body-form. So then, *Am. miurai* must be said as being of a very sluggish habit. On this account and from consideration of certain fact to be mentioned further on but which indicated that the Amœba was not fit for prolonged existence in the serous fluid containing it, I have naturally questioned myself if the forms I have considered as normal and healthy were really such and not already in the first stage of contraction. But I think this doubt can be done away with as being unfounded, for, were the animal in any way pathologically affected, the power of emitting and retracting those delicate pseudopodia on the knob should be the first to disappear.

The enclosures in the main body are the nucleus, the vacuoles and the minute oil-like corpuscles. They occur in the finely granular sarcode without any definite rule as to their positions.

The nucleus is generally invisible in the fresh or living state, at most only indistinctly indicated by an ill-defined, somewhat clearer space in the sarcode (figs. 1—5). When treated with the acetic acid, it comes forth with all the desirable distinctness (figs. 6,7 & 9). It occurs in twos or threes almost as often as it does in a single number. Round, oval or kidney-like in shape, it is bounded by a distinct nuclear membrane. The diameter measures 8—15 μ. The nuclear fluid is faintly granular, somewhat clearer than the sarcode and encloses within one or more prominent nucleoli, generally one in number.

The vacuoles are perfectly clear and form very conspicuous objects in fresh specimens, being very sharply outlined against the sarcode. They are inconstant as to their number and size. In some, notably smaller, individuals (fig. 5, *a* & *e*; fig. 6), they were found to be even entirely missing. But the majority of individuals showed them in numbers of one, two, three or several (see figs.). I think none of these vacuoles is pulsatile. Once a vacuole in a specimen, the first examined from a freshly taken abdominal fluid, was seen to vanish from view as slowly as it again reappeared; but then I was at a loss to decide, whether or not, the phenomenon was simply due to that vacuole getting alternately in to and out of the focus as the object slowly rolled about under the cover-glass. Treated with acetic acid, the vacuoles lose the boldness of contour, while the large vesicular nucleus, hitherto concealed, is made perfectly clear. In the number, size and non-contractility of the vacuoles the present species seems to agree exactly with *Am. fluida* as described by GREEFF.

The oil like corpuscles are small yellowish, highly refractive spherules of by no means uniform size. They are probably nutritive matter in reserve and identical with similar bodies that are so commonly met with in the body of other Amœbæ. Some individuals contained only a small number of these corpuscles, others in fair abundance. Also cases were not wanting in which not a trace of them was to be found.

Crystals and extrinsic matter, such as food-particles, &c., were not met with in the sarcode. Nor was the animal ever seen in the act of taking in food, which process, in my opinion, could only take place by means of the villiform pseudopodia at the knob. Whether the latter, like the similar organ of *Pelomyxa*, served at times for prehension, I have not been able to ascertain.

The above is the description of *Amœba mitrai* in what I consider its normal living state. Now besides such individuals, the serous fluid also contained a large quantity of peculiar cells, which were unmistakably nothing else than dead, at any rate much changed, bodies of the same animal. These are usually globular or more or less irregular in shape and of about the same size as normal individuals or larger on account of their swollen state. They are found either isolated or clinging together in variable numbers and forming conglomerate-like clusters (figs. 8 & 9). Sometimes such clusters are as large as to present a dimension of almost half a millimeter. The cells are characterized by having one or several large vacuoles that press the scanty protoplasm and the nucleus between them or against the peripheral wall. They often present the form of thin-walled strongly distended vesicles. The protoplasm contains the same oil-like corpuscles as the normal specimens; the nuclei, made visible after treatment with acetic acid, are likewise exactly the same. The villous knob and with it the pseudopodia have disappeared, leaving no trace whatever. A similar swelling was observed by GREEFF in *Am. fluida* when left in certain liquids, the enveloping membrane then showing a gap at the position where the villous knob has disappeared. Such a gap was not visible in my objects, what was probably largely due to the thinness of the membrane. The cells have not the slightest power of active motion and I think no one, who sees them, will hesitate to consider them as dead and as being prevented from speedy bursting and collapse only by the presence of an enveloping membrane. The existence of transitional stages between the normally

conditioned *Amœba* and the cells in question definitely establishes the derivation of the latter from the former. In fig. 4 is represented a specimen which is evidently on the verge of becoming morbid. It still shows signs of life inasmuch as it possesses some pseudopodia, but the knob is stretched out to a great extent by the vacuoles that are encroaching upon it Indication is not wanting that a part of the swelling contents has protruded itself hernia-like through the opening of the enveloping membrane. Should the pseudopodia in such a specimen cease to exist with the extinction of life and the body swell somewhat more as the result of imbibition, the metamorphosis into the state of the above described cells would be completed.

As already mentioned, both the living and the dead individuals were found together even in the freshest fluid, still warm and guarded against injurious influences. Care was taken to sterilize all the wares and instruments that were to come into contact with the fluid and observations were made by means of a microscope to which was fixed an arrangement that effectually kept the preparation at the normal body-temperature. Examined under such precautions, every preparation made of a drop of the fluid always contained the *Amœba* in the two conditions referred to, in such a number that it hardly ever needed a much prolonged search to come across one or the other kind, even though the power used were a moderately strong one. Preparations of the sediment, that formed itself after standing for some time, of course contained the parasites in much larger proportions, the majority of which were dead and adhering together in clusters. In the fluid kept overnight, they were almost all, if not without exception, dead and much swollen up. It is important to mention that it made no difference on their mortality whether the fluid was allowed to cool or kept in a warm chamber at the body-temperature ever since its extraction. Let it be also mentioned here that I have not been able to observe the mode of reproduction, beyond what is suggested by the possession of more than one nuclei or the occasional occurrence of biscuit-like forms (fig. 5, *b*).

The above observation tends to show, in my opinion, that the serous fluid was not a medium fit for the parasite to continue its vigorous existence,—that the real place of its parasitism is to be sought somewhere else than in the fluid that contained it. The parasites were evidently dying off in the serous fluid while

still within the patient's body-cavity. Above all then, the tissues of the tumors suggest themselves as most likely the proper home of the parasites, whence they might have fallen into the fluid-accumulation of the body-cavity or into the alimentary canal by rupture. At the post mortem examination, which was undertaken eighteen hours after death, Prof. MIURA found a number of dead, swollen and motionless Amœbæ on the surface of the tumors. Further results of his extended researches on the pathological parts remain yet unknown to me. It is hoped that in his forthcoming report he will be able to bring forward facts which will help to clear up the question of the relation that the parasites bore to the patient's disease.

In conclusion I wish to express my thanks to Prof. K. MIURA for supplying me with both materials and informations, without which I could never have been able to complete this report.

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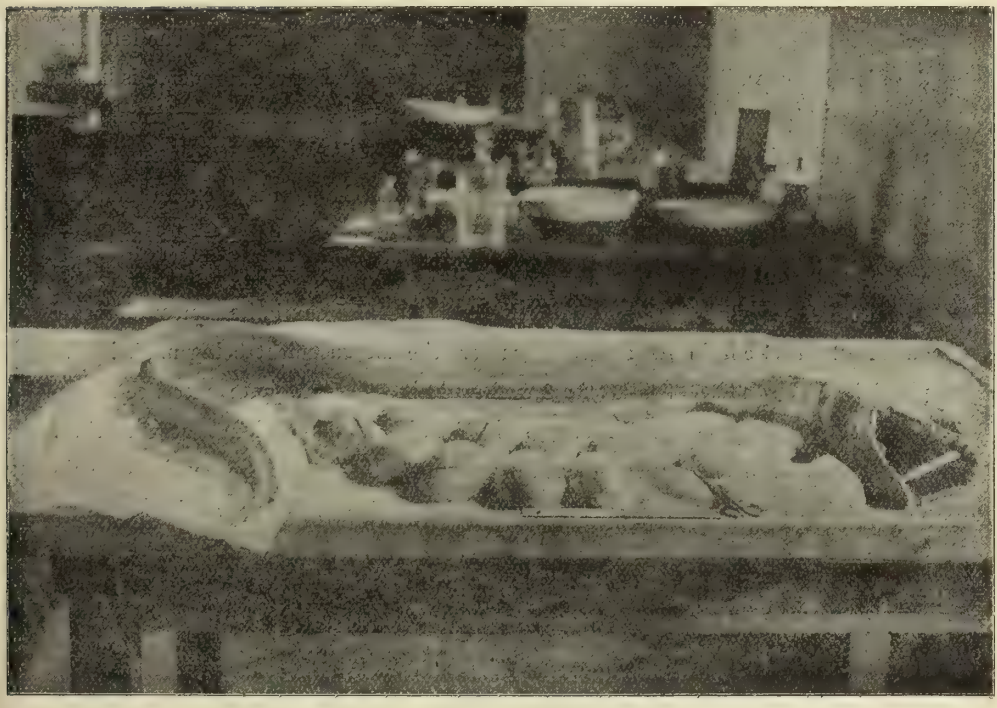
NOTES ON SOME EMBRYOS OF CHLAMYDOSELACHUS ANGUINEUS GARM.*

By T. NISHIKAWA.

Fisheries Bureau, Department of Agriculture and Commerce, Tokyo.

With Pl. IV.



So far as our present knowledge is concerned *Chlamydoselachus anguineus* is confined in Japanese waters to the sea of Sagami; but we are not able to point out the precise part where the shark lives. We only know that it is occasional-

* Having been asked to look through and prepare for publication Mr. NISHIKAWA's manuscript on the embryos of *Chlamydoselachus*, I have prepared the following notes, which though confessedly fragmentary, deserve perhaps to be put on record as referring to a rather rare form. The manuscript had been finished in June of the last year, and hence no reference is made to COLLETT's paper recently published (On *Chlamydoselachus anguineus* A remarkable Shark found in Norway.) Mr. NISHIKAWA tells me, however, that the female genital organs of *Chlamydoselachus* are essentially like those of other sharks, and I can confirm his statement from a passing examination of a specimen brought some time ago to my laboratory. COLLETT's description of these organs appears to me irrelevant.—S. GOTO.

ly brought to the Tokyo market by fishermen from Bōshū, on the eastern side of the Bay of Tokyo, and also that it is sometimes, though very rarely, caught by the fishermen of Misaki. The ordinary fishing apparatus must be ineffective against such sharp teeth, and it must be largely by chance that specimens of this interesting shark are occasionally brought up from the deep. Nevertheless I have been able to obtain a few developmental stages, and I propose in this paper to make a few notes on them.

Chlamydoselachus anguineus is viviparous, and the breeding season is spring, extending from about the end of March to the beginning of June. The left oviduct is always rudimentary,* but the nidamental gland of the right side is better developed than that of the opposite side. The right oviduct is very much distented and contains from 3—12 eggs, these numbers being the limits observed in seven specimens. The oviduct is only about 60 cm. long, and one can imagine the degree of its distension when as many as twelve eggs, each 11—12 cm. long, are contained in it.

The egg is ellipsoidal, and varies between 6.5—7.5 cm. in its shorter diameter and 10.2—12.4 cm. in its longer diameter, the measurement being made in the physiological solution of salt (fig. 1 & 2). It bears a stumpy excrescence at one end and a slightly recurved flattened process, about 3.5 cm. long, at the other. The capsule is light brown and transparent. The space between the capsule and the yolk-sac is, in earlier stages, very insignificant, being confined mostly to the two poles of the egg, and is filled with the white, which is very fluid. The yolk is of a pinkish color, and the yolk-sac is very delicate. Hence it frequently happens that the contents of an egg get all mixed up during transportation.

The blastoderm has a yellowish red color, as in other sharks. The earliest stage that I have been able to obtain was nearly circular in form and had the diameter of 1.3 mm. The next stage was a blastula, with a distinct segmentation cavity, whose floor was bounded by what has been termed "periblast" with finely granular yolk, and merocytes, with vacuolated cytoplasm, due perhaps to the dissolution of the contained oil drops, and many nuclei. One end of the blastula was thicker than the other, and is evidently the "embryonic end" of BALFOUR,

* When no eggs are contained there is no perceptible difference in size between the two oviducts.—S. G.

and the "anterior end" of RÜCKERT. On the surface of the blastoderm the cells are arranged epithelially. Most cells of the blastoderm are rich in yolk granules, but at the bottom of the blastoderm they have only a coarsely granular cytoplasm. The blastodermic cells are added from the periphery by the merocytes with fine yolk granules, as may be seen from cut 1, which has been composed from two consecutive sections. I have also found a cell simply resting on the floor of the segmentation cavity; but I cannot say for certain whether it originated from the periblast or from the blastoderm. Besides the stages mentioned above I have also obtained a gastrula, which was oval in form and 3 mm. in length. I have nothing special to add about it, as it was like the gastrula of any other shark.

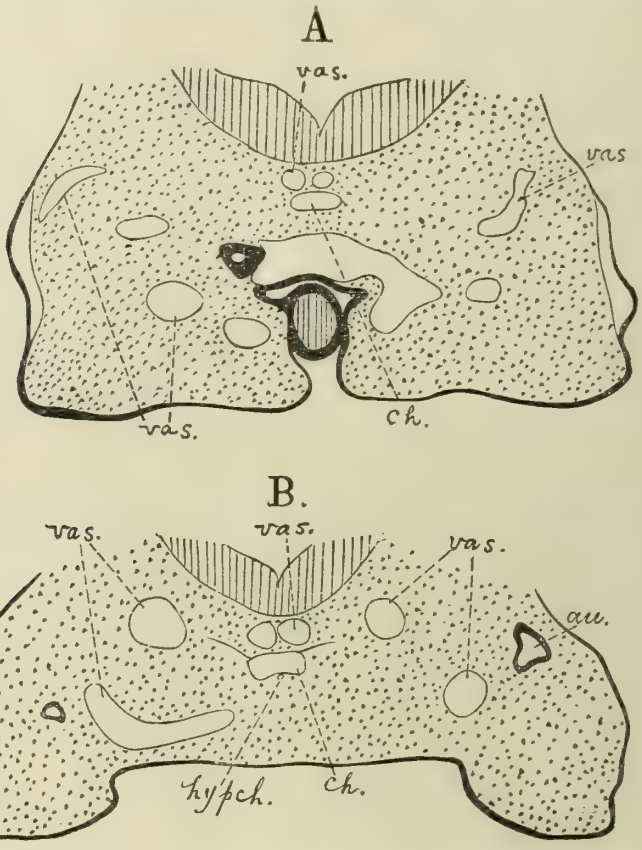
Cut 1. Zeiss 4 DD.

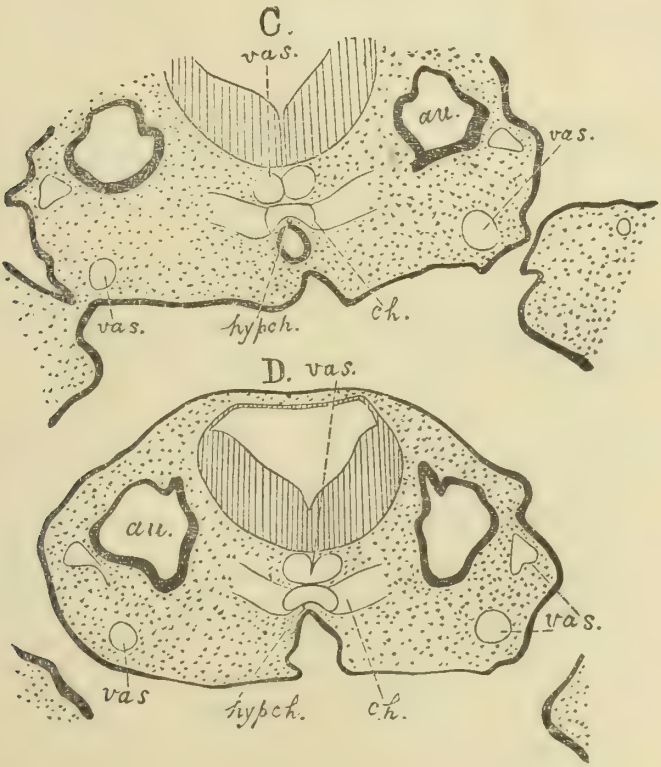
The youngest batch of embryos was obtained from a specimen 170 cm. long, which was brought to the University on the 26th of May (1896). There were six embryos 32, 35, 43, 48, 50, and 60 mm. long respectively. Each embryo was attached to its large yolk-sac by means of an umbilical cord, which allowed considerable movement to the embryo. The circulation in the yolk-sac could be clearly traced and is reproduced in figs. 1 and 2. On leaving the umbilical cord the artery and the vein run in opposite directions. The former receives on its course a number of smaller veins from the two poles of the yolk-sac, and divides finally into three main branches. The artery runs for some distance without giving off any branch, and then divides into two main vessels, which after running for a short distance parallel to each other, forms at last, on the opposite side of the yolk-sac, an elongated, irregularly shaped arterial ring, from which numerous small vessels radiate towards the periphery. The arterial ring just mentioned is still wide apart in the embryo of 32 mm., but in one of 43 mm. its two halves almost touch each other; but in other respects there is no change in the circulation. The embryos themselves are transparent, and the large liver-lobes with their blood vessels, the cardinal veins, and the trunk vessels can be seen from outside.

The embryo of 32 mm., the smallest one I have got thus far, may be compared with BALFOUR's stage M. The umbilical cord is 7 mm. long and 2.5 mm.

across. All the fins are clearly visible, and the nasal sacs are to be seen as two small pits. There are seven pairs of visceral clefts opening to the exterior, of which the second is widest and the hindmost smallest. The first cleft has now commenced to be metamorphosed into the spiracle. The upper jaw is still in the form of a transverse ridge, and its two halves are still widely separated in the median line. The external gills have begun to appear on each visceral arch, including the spiracle; and those of the second slit, or the first gill cleft of the adult are longest.

The head of this embryo is very different from that of the adult. In the dorsal or ventral aspect the snout is pointed, but in profie it is rounded; and there is a small depression between the fore and mid-brain (fig. 3), so that the head is already more or less compressed dorso-ventrally. In the dorsal view the *ducti endolymphatici* can be seen at the level of the first gill arch (fig. 6), and





Cut 2.

Four transverse sections passing through the region of RATHKE's and SEESSEL's pouches, of the embryo of 32 mm. There are 47 sections between A & B, 19 between B & C, and 17 between C & D, each equal to 10 μ.

their external openings can be readily recognized from outside. In sections it is seen that the epiblast surrounding the openings is thickened. There is as yet no cloacal opening, but its position is marked by a distinct prominence, where the wall of the alimentary canal and the skin are in close contact. In the ventral view of the head a pit can be seen in the median line directly behind the depression separating the two halves of the upper jaw (fig. 5). This is RATHKE's pouch, or the pituitary involution, which is closely connected with the infundibulum. In cut 2 I have reproduced some of the transverse sections passing through this region. In A both the pituitary involution and the infundibulum are to be seen, the former extending for 36 sections (each=10 μ). About 0.405 mm. behind the posterior border of RATHKE's pouch there is another involution,

which, however, cannot be distinctly observed from outside. This is SEESSEL's pouch, and is seen in sections in C & D; it is in close contact with the hypochorda.

The anlage of the lateral line is clearly visible on either side of the body. It is very narrow for the greater part of its length, and it stops short at about the middle of the tail, where it is thickened and presents a club-shaped termination. Throughout the greater part of the lateral line there is a lumen, which is slit-shaped in cross-section, but at the posterior extremity it is absent. In the anterior part where the lateral nerve is in close contact with the anlage of the lateral line the lumen opens to the exterior at several points. Cut 3 is a cross-section through what may be called the "growing point" of the lateral line. The backward growth of the club-shaped termination of the lateral line is caused by the multiplication of the cells of the deeper part of the superficial layer of the epiblast.

Cut 3.

Cross-section through the "growing point" of the lateral line. Zeiss 4 BB.

The spiral valve of the intestine makes its appearance as a folding of the intestinal wall.

The embryo of 35 mm. presents no markedly different features from the one just described. The club-shaped termination of the lateral line has only proceeded nearer the tail end.

The embryos of 43, 48, and 50 mm. all resemble in their general features. The external gills are longer and the jaws are more conspicuous. Figs. 7 and 8 are two drawings of the front part of the embryo of 50 mm. It may be noticed that the openings of the nasal sacs are no longer circular, as it was in the embryo of 32 mm. The head is now much compressed dorso-ventrally. The spiracles have changed considerably and are now seen as a pair of small pits. The *ducti endolymphatici* and their external openings are clearly visible. The second visceral clefts, or the first gill slits, tend to unite on the ventral side.

The embryo of 60 mm. corresponds to BALFOUR's stage Q. The dorso-ventral compression of the head has proceeded so far that its form is essentially that of the adult. The spiracles are no longer visible on the outside; the lower jaw has grown forward, and the mouth has been reduced to a slit-like opening. The flaps of the first gilt arches, or the opercular flaps have grown together on

the ventral side, and has reached the definitive condition. In short, the embryo is now essentially like the adult, with the exception of the external gills.

EXPLANATION OF PLATE IV.

Fig. 1. An egg with embryo of 43 mm., seen from the embryonal side. Nat. size.
„ 2. Ditto, seen from the anti-embryonal side. Nat. size.
„ 3.
„ 4.
„ 5.
„ 6. } Different views of the embryo of 32 mm. Zeiss 2 a_1.
„ 7.
„ 8. } Different views of the embryo of 50 mm. Zeiss 2 a_1.

Printed December 25, 1898.

Fig. 1.

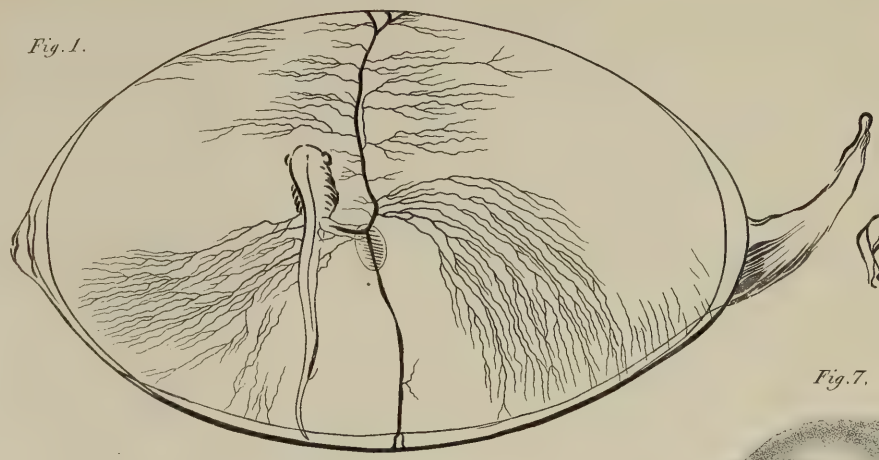


Fig. 2.

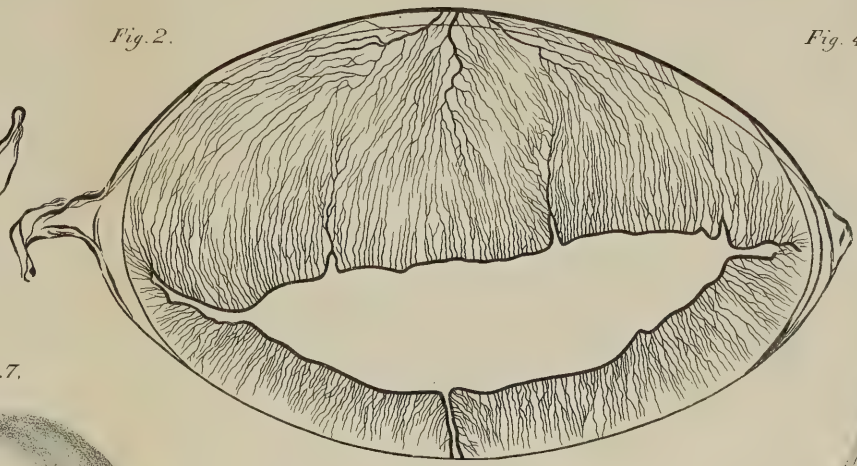


Fig. 4

Fig. 7.

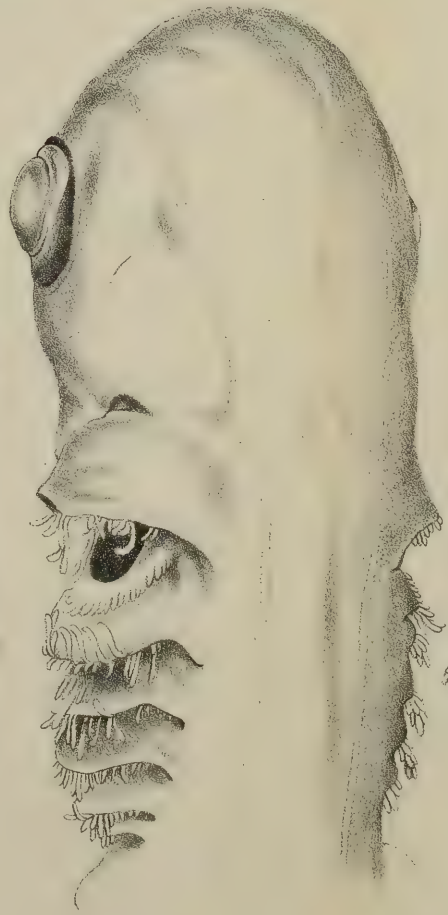


Fig. 5.

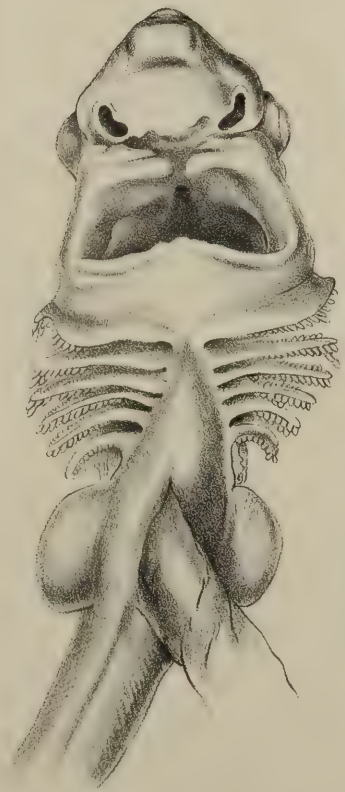


Fig. 3.

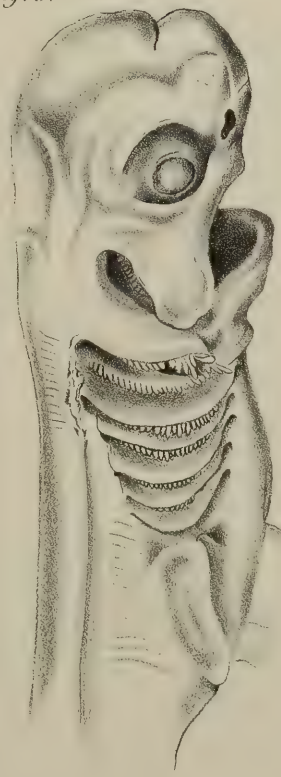


Fig. 8.

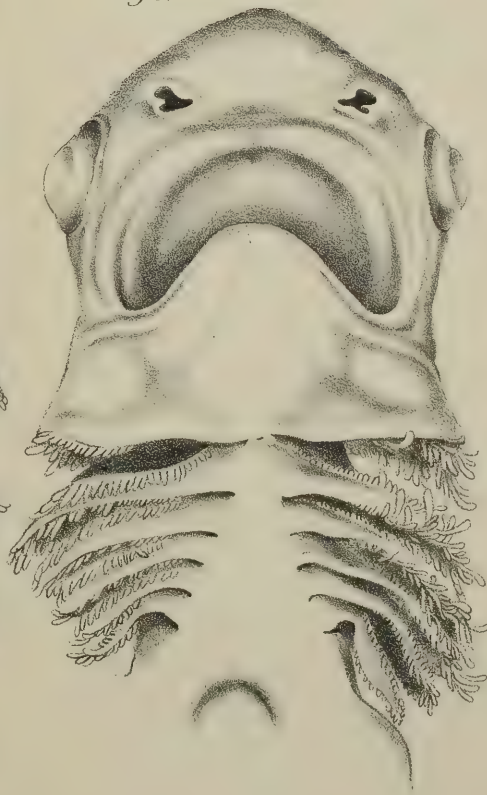
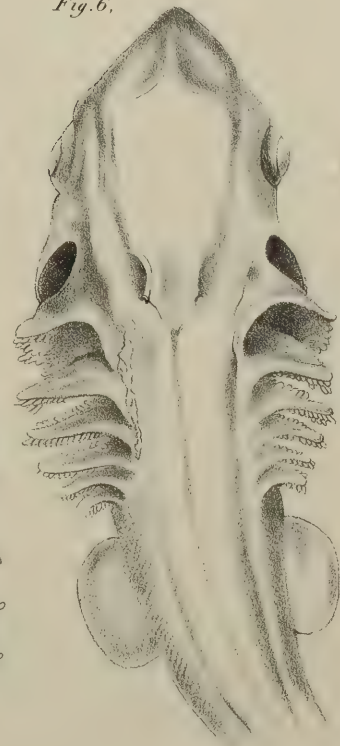


Fig. 6.



Lith et Imp. E. Koshiba.

ON VERMICULUS LIMOSUS, A NEW SPECIES OF AQUATIC OLIGOCHÆTA.

By S. HATAI.
First High School, Tokyo.

The present species is very common in the muddy gutters and ditches of our city, occurring together with *Limnodrilus*, *Tubifex* and other Limicolae. It creeps about on the lower surface of fallen leaves and other objects and rarely buries the anterior part of its body in the mud, as do most others; nor does it swing the posterior half of its body like the latter. The general color is tinged with a milky white and the intersegmental lines are blood red. It is very sluggish, and on being pinched never executes those writhing contractions, but simply retracts its body. These peculiarities serve to distinguish the present species readily from its cohabitants.

As measured on specimens killed with Perenyi's fluid after stupefying with weak alcohol, the body is 50—70 mm. long and 0.5—1 mm. wide. The segments number from 120 to 150 in sexually mature individuals. In the anterior part the body is cylindrical, but posteriorly it is somewhat flattened; the width gradually increases till about the middle of the body, but thenceforward it gradually diminishes. The prostomium is cylindrical and comparatively long. The clitellum is totally absent even in sexually mature specimens,—one point of difference from the known species of the genus, *Vermiculus pilosus* Goodrich.

The setæ are aggregated in bundles, which are arranged in four rows along the length of the body. Each bundle occupies in each segment the four corners of a square, and consists of 5—6 setæ in the anterior part and 2—3 in the posterior part; the setæ being all of the same size. Each bundle contains besides one or two small developing setæ in its setigerous sac. The setæ are all of the same form, being sigmoid and furcate at the end. There are no penial setæ.

The minute cilia-like processes on the body surface, supposed by Goodrich to be of a cuticular nature, can be observed with high powers; but in the present species they are closely set only in the posterior part of the body and gradually

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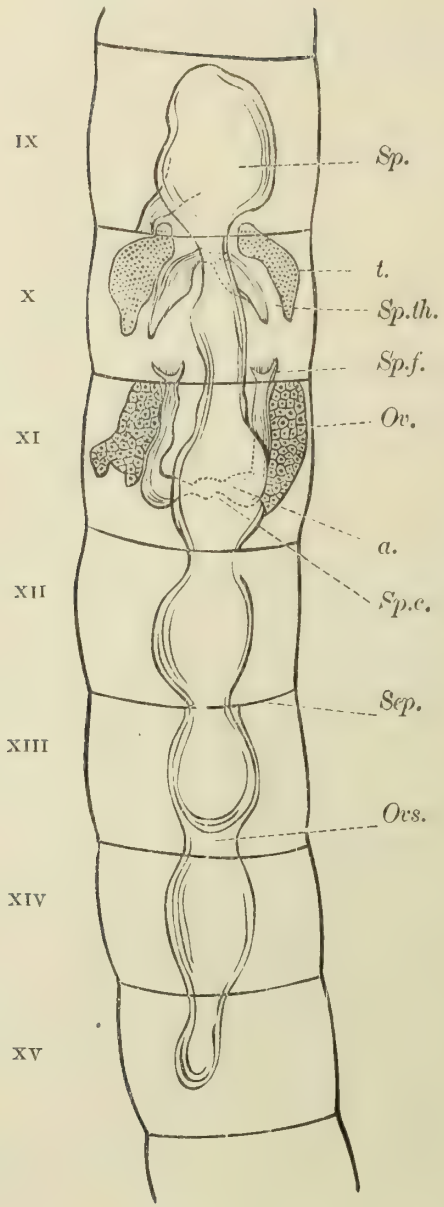
* Translated and edited by S. Goto.



Cut 1.

a. Atrium, *Ov.* Ovary, *Ovs.* Ovi-sac, *Sep.* Septum, *Sp.* Sperm-sac, *Sp.c.* Spermiducal chamber, *Sp.f.* Sperm-duct funnel, *Sp.th.* Spermatheca, *t.* testis.

decrease as we proceed anteriorly. From the fifth segment on they appear to be entirely absent.

The cœlomic corpuscles are very numerous in segments II—X and hides the internal organs. In segment XI they are few, and gradually decrease in the more posterior segments, being very few in the segments next the anus.

The septa are thick; they are all set transversely to the alimentary canal, and are not funnel-shaped as is the case in the anterior segments of most other Oligochaetes.

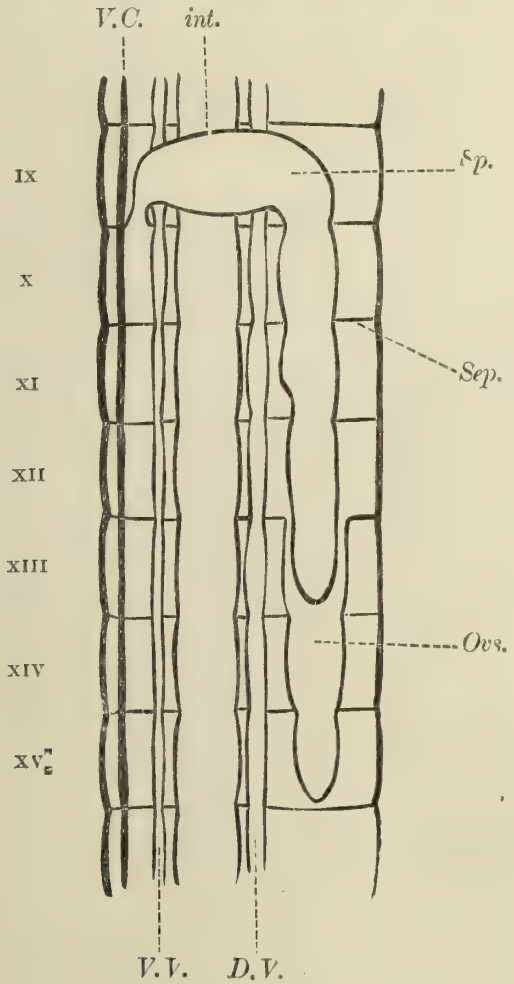
Genital System.

The genital organs present several points of difference from those of *V. pilosus*. I shall therefore describe them separately.

1. *Testes.*—One pair of testes are attached to the posterior face of septum IX/X, but a small portion of each testis projects into segment IX. The form varies according to development, but the posterior portion is usually finger-shaped.

2. *Sperm-sac.*—This is a single large sac extending from segment IX to segment XIII,

the larger portion of which lies on the dorsal side of the alimentary canal. In segment IX the posterior septum forms on the left ventral side an evagination towards the anterior, and this evagination is directly continued into the sperm-sac, which is very voluminous and is situated on the dorsal side of the intestine, in the median line. Of *V. pilosus* GOODRICH says (2, p. 261), "The spermatozoa are shed at an early stage of development into segment 10, and the anterior septum of this segment soon bulges out, forming a sac—the anterior sperm-sac. Later on this sperm-sac pushes its way across segment 9, through its anterior septum into segment 8. The hinder wall of segment 10 also bulges out, forming the posterior sperm-sac." In the new species before us these two sacs have become one and continuous. The walls of the sperm-sac are exactly like those of the ovisac to be presently described, and are covered with peritoneal cells on both surfaces. The hinder end of the sperm-sac projects into the cavity of the ovisac.



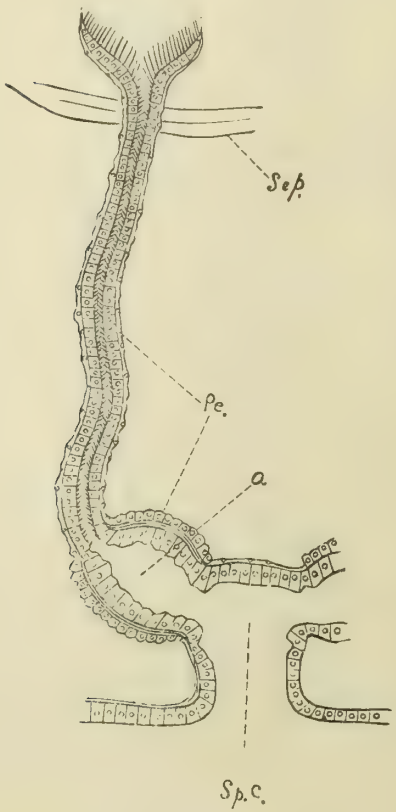
Cut 2.

D.V. Dorsal Vessel, *int.* intestine, *Ovs.* Ovisac, *Sep.* Septum, *Sp.* Sperm-sac, *V.C.* Ventral Cord, *V.V.* Ventral Vessel.

3. *Ovary.*—One pair attached to the anterior septum of segments X and almost reaching the posterior septum when fully developed, in which case the peritoneal covering is also very indistinct.

4. *Spermathecæ.*—One pair in segment X, spindle-shaped, and situated between the two testes, on either side of the intestine. The single coalesced duct opens to the exterior on the ventral median line, directly behind the intersegmental line IX/X. The internal surface of the sac is lined with a non-ciliated epithelium, which is followed by a layer of longitudinal and of circular muscle fibres. The external surface is covered with peritoneal cells. No spermatophores could be observed in the spermathecæ.

5. *Oviduct.*—In *V. pilosus* the oviduct is stated to be rudimentary, being represented by a pair of depressions of the 12th septum. In the present species no trace of the oviducts could be observed either in transverse or longitudinal sections.



Cut 3.

a. Atrium, *Pe.* Peritoneum, *Sep.* Septum, *Sp.c.* Spermiducal chamber.

6. *Ovisac* (*Receptaculum ovorum*).—One pair in segment XIII, being formed by the backward bulging out, on the left dorsal side, of the anterior septum, and extending sometimes into the 15th segment but sometimes stopping short in segment XIV. The mouth of the sac is very large and opens, as a matter of course, into the cœlom of segment XII. The anterior part of the ovisac encloses, as already stated, the hinder end of the sperm-sac, but the posterior part is slender. The ripe ova are found not only in the ovisac but also floating in the cœlom of this region. (In *V. pilosus* the ovisac opens into the cœlom of segment XI.)

7. *Sperm-duct.*—This is very different from that of *V. pilosus*. The funnel is relatively large and bores septum IX/X; it is continued into a slender duct, which, after running on the inner side of the ovary till about the

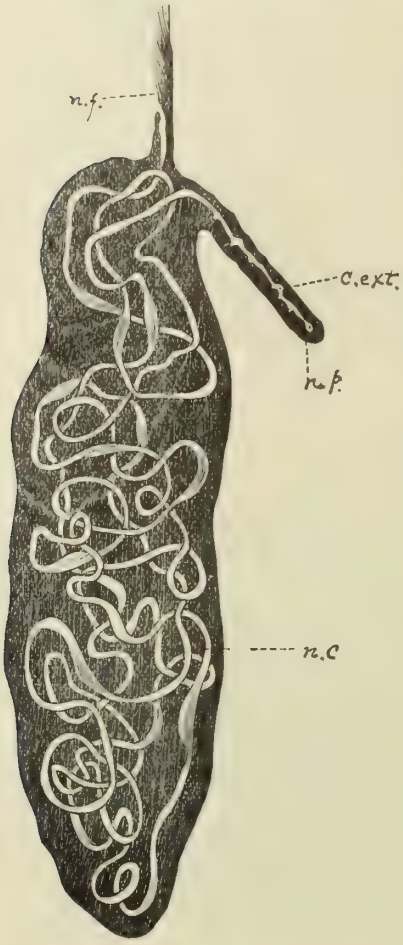
middle of segment X, curves slightly towards the median plane and opens into the atrium. The latter has a spacious ellipsoidal cavity and opens slightly in front of the setæ directly into the common sperm-duct chamber below the ventral cord, which is, as GOODRICH says, to be regarded as an invagination of the body-wall. In immature individuals the atrium is followed by a slender duct-like portion, but as the genital organs approach maturity the invagination of the body-wall becomes greater and the dorsal wall of the duct-like portion is converted into the roof of the sperm-duct chamber, and the atrium comes to open directly into the latter. Even in mature specimens the sperm-duct chamber is sometimes very small and the duct-like continuation of the atrium persists. The internal surface of the funnel as well as of the duct is lined with ciliated epithelium, but in the atrium the cilia are absent and the cells are taller and glandular. The outer surface of the whole organ is covered with peritoneal cells, which are conspicuously taller around the atrium. Between the inner and the outer epithelium there is a layer of circular and longitudinal muscle fibres which are most strongly developed around the atrium and very thin in the funnel and the duct. There is no penis.

Alimentary Canal.

The alimentary canal is simple as in other Tubificidæ. The mouth lies on the ventral side of segment I; the pharynx is large and lies in segment II; the œsophagus is slender and extends through segments III and IV, the intestine beginning in segment V. The lumen of the intestine is about equal to that of the œsophagus, but as the former is surrounded by hepatic cells it appears externally thicker than the œsophagus. On the dorsal side of the pharynx there is a group of goblet-shaped unicellular glands with long necks opening into the basal portion of the ciliated epithelium of the pharynx. The ventral wall of the pharynx is very thick and is concave towards the ventrum. The œsophagus and the intestine are lined by a ciliated epithelium, which is followed by a layer of circular and of longitudinal muscle fibres. The intestinal wall is very rich in blood-vessels. In sections these are seen to be situated between the internal epithelium and the layer of circular fibres, and are traversed by connective tissue trabeculæ.

Nephridium.

The nephridia are present in segments VII—IX and in all segments posterior to XII inclusive except the last. In each nephridium we may distinguish three portions, the internal tubular portion, the middle enlarged portion, and the external tubular portion. The middle portion makes up by far the larger part of the whole organ, and reaches nearly the posterior septum of the segment on either side of the intestine; externally it is continuous with its fellow on the opposite side of the body, although the nephridial canals of the two are entirely separate. The external tubular portion opens to the exterior on the outer side of the ventral seta-bundle. The funnel is very small, and is somewhat sagitate or globular according as the ciliated process is thrown out or drawn in; the latter being formed by the ventral margin of the funnel. (In *V. pilosus* it is formed by the dorsal lip of the funnel.) The internal surface of the funnel as well as its margin is thickly covered with long vibrating cilia, and during life the ciliated process is contantly thrown out and drawn in. Sections show that there is a transverse constriction at its base, upon which it is folded when drawn in.



Cut 4.

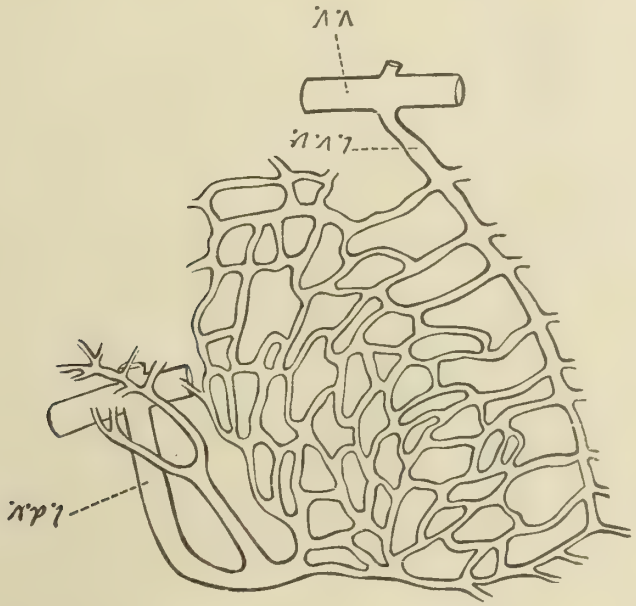
C.ext. Canal to the exterior, *nc.* Nephridial canal, *n.f.* Nephridiostome, *n p.* Nephridiopore.

There is only one nephridial canal of small calibre, which winds back and forth several times in the enlarged middle portion. The portion lying between the nephridiopore and the middle portion, sends out several blind diverticula. The walls of the canal consist mostly of a syn-

citium, and the cell boundaries can be recognized only in the peripheral part. Here and there the canal is enlarged and forms the ciliated ampullæ.

Vascular system.

The main part are the dorsal and ventral vessels. The dorsal vessel divides into two in the prostomium, and these two vessels after dividing several times supply the brain and the body-wall of the most anterior part. The lateral vessels, which arise from the dorsal vessels, are very small in segments I, II, and III; they gradually become larger in segments IV—X, in which last segment they are considerably dilated. The largest lateral vessels lie, however, in segment XI, and from this on the lateral vessels are exceedingly small and just recognizable. The dorsal vessel alone beats, although the ventral vessel also executes some inconstant pulsatory movements. In each segment the dorsal vessel is provided with a group of valvular cells, which are also present in the constricted portions of the lateral vessels. These valvular cells are more numerous in the larger vessels; they are pear-shaped and contain a granular substance. The



Cut 5.

D.V. Dorsal vessel, *L.D.V.* Lateral dorsal vessel, *L.V.V.* Lateral ventral vessel, *V.V.* Ventral vessel.

dorsal lateral vessels are gradually enlarged from segment IV backwards, and the number of constrictions also increases.

The dorsal vessel divides into two also in the anal segment, in which it ramifies greatly.

The ventral vessel, like the dorsal vessel, sends out a pair of lateral vessels in each segment, which are continued into the corresponding vessels from the dorsal trunk, not directly as in most other oligochætes, but by the intermediation of smaller vessels.

The ventral vessel divides into two in segment III; these two branches proceed forwards and curving towards the dorsum in the first segment become continuous with the single dorsal vessel. A little in front of the point of separation of the two vessels just mentioned, these are united by a transverse vessel, from which is given off in the median line a branch which itself divides into two in segment I. These two vessels break up into smaller branches, which become continuous with the corresponding vessels of the dorsal side. Besides the lateral vessels corresponding to those of the dorsal vessel, the ventral vessel sends out another set of lateral vessels, which always alternate with the former.

The branching of the lateral vessels of the dorsal and ventral vessels is dissimilar. The dorsal lateral vessels divide successively, while in the ventral lateral we can recognize one main trunk, from which a number of smaller branches are given off symmetrically on either side.

In only a few among the many specimens that I have observed have I been able to demonstrate valvular cells in the ventral vessel; but their position is very variable, and they are mostly confined to the anterior part of the body.

COMPARISON OF THE TWO SPECIES.

	V. pilosus Goodrich.	V. limosus, n. sp.
Clitellum	X—XIII.	Wanting.
Sperm-duct.	Of uniform calibre throughout; only the middle portion appear swollen, owing to the tall peritoneal cells surrounding it; no atrium.	Gradually increases in calibre backwards; opens into a distinct atrium.
Nephridium	Begins in segment VI.	Begins in segment VII.
Oviduct	Rudimentary.	Absent.
Sperm-sac	Anterior sperm-sac in segment IX; none in X; posterior sperm-sac extending through segments XI—XII.	A single sperm-sac extending through segments IX—XIII.
Ovisac	Formed by the posterior septum of segment XI.	Formed by the posterior septum of segment XII.
Cilia-like process	Uniformly present.	Absent in the anterior portion, thickly set in the posterior portion.

In view of the characters of the new species above set forth we must read in the generic diagnosis given by BEDDARD "*Clitellum X—XIII or absent*" instead of "Clitellum X—XIII."

Literature on Vermiculus.

BEDDARD, F. E.—A Monograph of the Order of Oligochæta. 1895. P 271.
GOODRICH, E. S.—Note on a New Oligochæta. Zool. Anzeiger, XV. 1892. Pp. 474—476, 2 fig.
„ —On the Structure of Vermiculus pilosus. Quart. Jour. Mic. Sc, XXVII, N. S. 1895. Pp. 253-267, pl. 26—28.

Printed December 25, 1898.

INSECTS COLLECTED ON MOUNT FUJI.

By M. MATSUMURA.

Entomological Laboratory, Agricultural College, Sapporo.

Mt. Fuji as a collecting ground is noted from former days since the French Jesuits, as Abbé David and others trod the unbeaten path of entomological field, somewhat more than thirty years ago.

The time which is yearly allowed the public to ascend the mount, is from the latter part of July to the middle of September, especially for the purpose of religious devotion. Many foreign as well as native entomologists visit it every year. There are many insects which are peculiar to this mountain, and the species which are commonly found here are found to be rarer as we come down toward the foot. *Thecla ibara, T. orsedice, Niphundus fusca, Psychostrophia melanargia, Schistomira funeralis* (*Bekkochō*), *Carabus fujisanus, Panorpa leucoptera,* etc. are all noted insects here; while many others have a close resemblance to those of Hokkaido.

I visited Mt. Fuji on July 21st and stayed there three days, devoting my time to the collection of insects. To say the truth, it was too early for collecting, and the noted insects known to be found here were not captured in my net, with a few exceptions. During my rambles I found *Tarobo* to be one of the best places for collecting. Here many trees and shrubs flourished, many flowers blossomed constantly and attracted gorgeous papilionids, such as *Papilio demetrius, P. alcinous.* The other common lepidopterous insects found near around here were the diurnals as *Neptis Pryeri, Lycæna Pryeri, Terias læta, Syntomis thelebus, Abraxas eurymedes, Vithora agrionides.* At night many heterocerous insects came to the light. Among them were the following ones: *Chœrocampa elphenor, Spilosoma seratopunctata, S. menthastri, Cymatophora* 2 *sp., Icterodes jaguaria, Hypena rhombalis* etc. As I ascended from "Tarobo" about five *cho,* I found that trees and shrubs suddenly gave way to dwarf shrubs and weeds, and next when I came to a place about 4,000 feet high no plants were to be seen except *Ontade—Polygonum polymorphum* var. *japonicum,* and a few shoots of a thistle, *Lenicus* sp. The *Polygonum* were matted here and there on the volcanic ashy soil and a few hypenid moths only flew away as they were disturbed. On ascending still further I came to the region occupied by

reddish volcanic rocks and sands. Here there was no vegetation at all. But still there were found geometrid moths as *Elphos latiferaria*, *Boarmia mœsta*, that flew away from about my feet as I trod up the course. Then I came to the place, commonly called *Rokugome*, where large blocks of rocks abounded and where I got *Calosoma mikado* accidently as I overturned a small stone. Here again I caught *Thecla smaragdina*, which I at first regarded as a new species, but on reflection was convinced, must be a variety of the above named species. Just at this time I saw a lycænid butterfly flying about the scattered stones, but the slope being 45° quite prevented me pursuing it. During this time which was spent for the travel from *Rokugome* to the top, where the shrine stands, I could catch no insect, being quite overcome by the very tiresome travel.

After starting from "Tarobo" at 4 o'clock in the morning we reached the top at 2 o'clock in the afternoon. The collection on the top was very poor and only the following insects were netted :—*Argynnis Paphia*, *A. nerippe*, *Pompilus bioculatus*, *Mallophora anicius*, *Endoiasimyia indiana*, *Gn ? sp ?*, *Musca corvina*, *M. domestica*, *Leucorrhina fujisana*. Among these the most common insect was *Mallophora anicius* (*Shioya-abu*). It was met everywhere we went, being easily discerned by its peculiar buzzing sound. If alights upon a stone awaiting for booty. It the prey comes within its reach, it darts off and clasps it with its feet.

The top of the mount was very cold and after one night's stay we were glad to descend, the more so on account of the scarcity of insects.

On the whole the field which is commonly called *Susono*, containing the large area between Gotenba and "Tarobo," is very rich with the hexapod tribe, especially the moths ; but mammals, birds, reptiles, and amphibians seem to be very scarce ; no mammals came across my path, and only two kinds of birds fell within my vision. One was a kind of swift called *Cypselus pacificus*, which was to be seen two or three in number on the mountain top, cutting the air with a loud cry ; the other was a kind of lark, probably the species called *Alauda japonica* found at a sandy slope about 7,000 feet high.

The following insects were caught on Mount Fuji.

HYMENOPTERA.

Apidæ.

Bombus lapidarius, L. Illig. Mag. V. 169.

Megachile centuncularis, Latr. Hist. Nat.

Vespidæ.

Polistes hebræus, Saus. Mon. Guêpes.

Polistes yokohamæ, Rad. Hor. Soc. Ent. Ross.

Monobia biangulata, Saus. Syn. Am. W.

Crabronidæ.

Cerceris unifaciata, Sm. Cat. Hym.

Ammophila infesta, Sm. J. E. S.

Ammophila sp.

I have never seen this species before. It may be a new species. But as I have not yet been able to identify it I cannot speak with certainty. ♀ Length 28 mm.—general form is much like *A. sabulosa*, but the abdomen is steel blue and the petiole glittering black except the lower part of the 2nd petiolewhich is red.

Ammophila sp.

This is very much like *A. impatiens* of Australia (Tran. Ent. Soc. 1878), except the face not being pubescent with silvery hair, and the first joint of the apical abdomen not being ferrugineous. This is a very common species on the sandy road as is also the former species.

Pompilidæ.

Pompilus bioculatus, Kirby. P. Z. S. 1893.

Scoliadæ.

Scolia quadrifasciata, Fabr. Syst. Piez.

Myrmicidæ.

Leptothorax molesta, Say. Bost. Jour. Nat. Hist.

Lasius fuliginosus, Latr. Hist. Nat. Fourm.

Aphænogaster famelica, Sm. T. E. S. 1874.

Formicidæ.

Polyrhachis sexspinosus, Latr. Hist. Nat. Fourm. 1874.

Polyrhachis lamellidens, Sm. T. E. S.

Camponotus ligniperdus, Latr. var. *obscuripes*, May. B. A. F. A. 1878.

Camponotus vitiosus, Sm. T. E. S. 1874.

Ichneumonidæ.

Anomalon sp.

Campoplex sp.

Tenthredinidæ.

Hylotoma pagana, Danz. Fauna Germ. 1293.

Allantus, n. sp.

This is not described in the "List of Hymenoptera" Vol. 1. of Kirby 1882, nor in any other paper we have yet found. Probably it may be a new species. Length 12 mm.—black with a violetious luster, labrum pale white, middle of antennæ and the basal 3 segments of the abdomen at the venter pale gey; wings fuscous.

COLEOPTERA.

Cicindellidæ.

Cicindella japonica, Guer. Rev. Zoolog. 1847.

Carabidæ.

Calosoma mikado, Bates, Geod. 235.

Staphylinidæ.

Staphylinus paganus, Sharp. T. E. S. 1874.

Lucanidæ.

Macrodorcas rubrofmoratus, Sn. V. Vollh. Tijd. E. 1868.

Scarabidæ.

Bolbocerus nigroplagiatum, Wat. T. E. S. 1875.

Apogonia major, Wat. T. E. S. 1875.

Anomala testaceipes, Mostch. Et. Ent. 1860.
Onthophagus ater, Wat. T. E. S. 1875.

Elateridæ.

Lacon binodulus, Motsch. Et. Ent. 1860.

Telephoridæ.

Macrolycus flavellatus, Motsch. Reise. Amur. 1860.
Luciola vitticollis, Kies. Berl. E. Z. 1874.

Tenebrionidæ.

Plesiophthalmus æneus, Motsch. Et. Ent. 1861.

Mordellidæ.

Mordellistena signatella, Mars. Ann. France. 1876.

Chrysomelidæ.

Melasoma ænea, L. Syst. Nat. 1767.
Sphenoraia melanocephala, Jac. P. Z. S. 1885.

LEPIDOPTERA.

Papilionidæ.

Papilio demetrius, Cram. Pap. Ex.
Papilio alcinous, Klug. Neu. Schmett.

Pieridæ.

Terias læta, Boisd. Sp. Gen.
Colias hyale, L. Syst. Nat.

Lycænidæ.

Niphandus fusca, Butl. P. Z. S. 1881.
Thecla smaragdina, Brem, Lep. Ost-sib.
Polymmatus phlæas, L. Syst. Nat.
Lycæna argiades, Pallas, Reisen.

Lycæna argia, Men. Cat. Mus. Petr.
Lycæna argiolus, L. Syst. Nat.
Lycæna Pryeri, Mur. Ent. Mon. Mag. 1873.

Nymphalidæ.

Apatura ilia, Schiff. S. V. 1776.
Limenitis sibylla, L. Syst. Nat.
Neptis Pryeri, But. T. E. S. 1871.
Neptis aceris, Lepechin, Reise.
Neptis lucilla, Schiff. S. V. 1776.
Vanessa cardui, L. Syst. Nat.
Vanessa c-aureum, L. Syst. Nat.
Argynnis paphia, L. Syst. Nat.
Argynnis nerippe, Feld. Wien. Ent. Mon. 1862.

Satylidæ.

Mycalesis gotama, Moore. Cat. Lep. 1857.
Ypthima baldus, Fabr. Syst. Ent.
Satyrus dryas, Scop. Ent. Carm.
Lethe sicelis, Hew. Ex. Butt.
Neope callipteris, Buth. Ann. & Mag.

Hesperidæ.

Pterygaspidea sinica, Feld. Wien. Ent. Mon. 1862.
Daimio tethys, Men. Enum. 1855.
Isoteinon lamprospilus, Feld. Wien. Ent. Mon. 1862.
Pamphila pellucida, Murrey, Ent. Mon. Mag. 1875.
Pamphila varia, Mur. Ent. Mon. Mag. 1875.
Hesperia sylvanus, L. Syst. Nat.
Hesperia flava, Murrey, Ent. Mon. Mag. 1875.

Sphingidæ.

Hemaris radians, Walk. Cat. Lep. Het. 1856.
Macroglossa bombyliens, Boisd. Sp. Ger. Lep. 1876.
Deilephila Galii, Fabr. Sp. Ins. (Larvæ).

Chœrocampa elphenor, L. Syst. Nat.

Zygœnidæ.

Syntomis thelebus, Fabr. Ent. Syst.

Pryeria sinica, Moor. An. & Mag. 1877.

Arctidæ.

Stigmatophora flava, Brem & Grey. Schmet Nord. China.

Spilosoma seratopunctata, Motsch. Et. Ent. 1860.

Spilosoma menthastri, Fabr. Ent. Syst. 1853.

Bireta pallida, But. A. M. N. H. 1877.

Bombycidæ.

Clisiocampa neustra, L. Syst. Nat. (Egg).

Gastropacha pini, L. Syst. Nat. (Larva).

Numenes disparilis, Staud. Rom. Men.

Liparidæ.

Lymantria aurora, var. *fusca*, Leech. P. Z. S. 1887.

Cymatophoridæ.

Cymatophora sp. (N. sp. ?)

Primaries fuscous, costal margin broadly grey, tinged with a pinkish shade, orbicular grey, outlined in fuscous with a center of the same color ; reniform closely in contact with the orbicular, is also grey out-lined in fuscous with a central same colored line and a same colored mark basally ; outer side of the reniform is of a white color with a denticulated fuscous line transversely ; toward the outer margin there are two black obscure, transverse bands, one of them being bordered with a grey internally ; secondaries also fuscous a little deeper toward the outer margin. Wing Exp. 51 mm. Corp. L. 20 mm.

Cymatophora sp. (N. sp. ?)

Primaries long narrow, grey with greenish and reddish shades, mottled with many small reddish brown punctures, double curved bands near the base reddish brown, orbicular absent, reniform black nearly crescent form, costal margin mottled with blackish markings, waveline ("Wellenlinie") black internally

bordered by a brownish green band, with a few violet tinge in a certain light; secondaries greyish, shining.

Wing Exp. 39 mm. Corp. L. 12 mm.

Geometriformidæ.

Catocala sp. (N. sp. ?)

Somewhat resembles that of the noctuid moth, *Triphænopsis lucilla*, Butl. in its general aspect. Wing Exp. 48 mm. Corp L. 22 mm. Reniform white and very large.

Dendrometridæ.

Spilopera debilis, Butl. Typ. Lep. Het. 1878.
Chærodes dictynna, Butl. Typ. Lep. Het. 1878.
Deroca phasma, Butl. Typ. Lep. Het. 1878.
Boarmia mœota, Butl. T. E. S. 1861.
Elphos latiferaria, Walk. Typ. Lep. Het. 1878.
Abraxas eurymedes, Motsch. Et. Ent.
Vithora agrionides, Butl. Typ. Lep. Het. 1878.
Icterodes jaguaria, Guen. Phal. 1857.
Icterodes fraterna, Butl. Typ. Lep. Het. 1878.
Abraxas languidata, Walk. Cat. Lep. Het. 1862.
Thalassodes ambigna, Butl. Typ. Lep. Het. 1878.

Phytometridæ.

Scotosia ærtata, Hübner. Pap. Tab.

Pyralidæ.

Marmorinia amphidecta, Butl. Typ. Lep. Het. 1878.
Hypena rhombalis, Guen. Delt. 1854.
Hypena zilla, Butl. Typ. Lep. Het. 1878.
Herminia albomaculatis, Brem. Lep. Ost-sib. 1864.

DIPTERA.

Tipulidæ.

Phachyrhina sp.

Tabanidæ.

Tabanus yokohamæ, Bigot. Mem. Soc. Z. F. 1891.

Tabanus striatus, Fabr. Ent. Syst.

Asilidæ.

Mallophora anicius, Wk. List. Brit. Mus. 1854.

Promachus yezonicus, Bigot. Bull. Ent. Fr. 1887.

Promachus sp.

Dasypogon japonicum, Bigot. Bull. Sec. Ent. 1887.

Laphria auricincta, V. d. Wulp ? Tijd. V. Ent. 1872.

Therevidæ.

Thereva marginula, Meig. Sys. Besch.

Syrphidæ.

Syrphus balteatus, de Geer. Mém. 1780.

Syrphus ribesii, L. Syst. Nat.

Syrphus sp.

Eristalis nemorum, Fabr. Ent. Syst.

Eristalis tenax, L. Syst. Nat.

Endoiasimyia indiana, Bigot. Ann. Soc. Ent. 1874.

Cheilosia sp.

Gn? sp?

I have never seen nor heard of this dipterous insect before, and could not find any allied genus which exactly coincides in its character, neither in Meigen's "Systematische Beschreibung" nor in any other book to which I have access. Form of the antennæ and the thorax is very much like that of the genus *Chrysotxm*, But the venation is quite different, rather resembling that of the genus *Eristalis*, the third longitudinal vein bring curved much. It is the only specimen I have ever caught and so can not be sent away to be identified. I wil[now describe its character briefly.

Corp. L. 16 mm.

Wing Exp. 30 mm.

Antennæ black, antennal peduncle and the vertex purplish, face, collar, isdes of the thorax, scutellum except the dish, 4 curved marks on each side of the

abdomen, and the legs yellow; thorax æneus with 2 longitudinal greenish yellow streaks; abdomen black, apical margin of each segment more or less dull yellow; wings hyaline with a fawn shade especially at the costal margin.

It was caught at the top of the mount about 12,000 feet high where the insect rested upon a reddish volcanic stone, warmed by the vapors that arise from the internal heat.

Muscidæ.

Musca corvina, Fabr. Spec. Insect. 1781.

Musca domestica, L. Faun. Suec. 1833.

Cyrtoneura sp. ?

Sarcophaga sp.

This much resembles the species *S c r-aria*, L. but can be easily distinguished by the colors of the venation.

Cynomyia violacea, Macg. Suit. a Bull. 1834.

Echinomyia fera, L. Syst. Nat.

APHANIPTERA.

Pulicidæ.

Pulex irritans, L. Syst. Nat.

RHYNCHOTA.

Pentatomidæ.

Halyomorpha picus, Fabr. Ent. Syst. (Nymph).

Acanthosoma distinctum, Dall. Brit. M. List. 1851.

Coreidæ.

Homœocerus punctipennis, Uhl. Proc. Acad. Ph. 1860.

Lygæidæ.

Pamera hemiptera, Scott. A. & M. 1874.

Cicadidæ.

Pomponia japonensis, Dist. Monog. Orient. Cicad. 1892.

NEUROPTERA.

Panorpidæ.

Panorpa macrogaster, M'Lach. An. Soc. Ent. Belg. 1872.

Leptopanorpa Ritsemæ, M'L. An. Soc. Ent. Belg.

Hemerobidæ.

Chrysopa intima, M'L. A. S. E Belg.

Osmylus sp.

PSEUDONEUROPTERA.

Libellulidæ.

Diplax elata, Selys. Ann. Soc. Ent. Belg. 1872.

Thecadiphax crotica, Selys. Var. fastigiata, Selys. Ann. Soc. Ent. Belg. 1883.

Leucorrhinia fujisana, sp. nov.

Abd. ♂ 24 mm. ♀ 20 mm., post. wing ♂ ♀ 28—29 mm. Corp. brownish yellow, wings hyaline, costal margin orange yellow, also the menbranule and the basal half of the wing. Pterostigma greyish yellow (length 3 mm.). Reticulations black, but the costal, the basal and the menbranule yellow; anticubital cells 8; post-cubitals 10; the triangles show nothing unusual. This beautiful insect is very common at the top of the mount resting upon the warm heated rocks, but is not to be seen any where as we come down to the level.

Pseudothemis nigrifrons, sp. nov.

Abd. ♂ 35 mm. Post. wing ♂ 39 mm. This much resembles *P. zonata*, Burm., but differs; first, wings are transparent with a purplish luster; secondly, pterostigma large (4 mm. long); thirdly anticubitals 19; postcubitals 13; fourthly head with the face glittering black, the part of the pronotum streaked with a broad yellow band longitudinaly which is divided in the middle by a narrow black line; fifthly, the third and the fourth abdominal segments are not wholly yellow, but interrupted by black lines and marks, the fifth segment also with a yellow mark at the venter; sixthly the superior caudal appendage is yellow except at the base.

Epophthalmia elegans, Hagen. Brauer. Vog. Nov.

Gomphus Pryeri, Selys. Ann. Soc. Ent. Belg. 1883.

Cordulegaster Sieboldii, Selys. Monog. Gomph.
Calopteryx atrata, Selys. Syn. Calopt.
Mnais strigata, Hagen. Syn. Calopt.

November 17th, 1898.

Printed December 29, 1898.

	No.	Actual Length in mm. T.L.	Head.	G.O.-D.	G.O.-V.	D.-A.	C.M.	P.	Length of Head etc. in percent. of the Total Length. T.L.	Head.	G.O.-D.	G.O.-V.	D.-A.	C.M.	P.	Length of Head contained in the Distance between G.O.&D.	G.O &V.	With respect to the proportional Lengths of the Head & Dist. bet. G.O. and D. are
Tokushima, Shikoku.	66	377	49	63	101	41	15	16	100	12.99	16.71	26.70	10.87			$1\frac{2}{7}$	$2\frac{3}{49}$	*vulgaris.*
	67	379	52	65	105	39	14	17	„	13.47	17.14	27 70	10 29			$1\frac{1}{4}$	$2\frac{1}{5\,8}$	„
	68	385	56	70	113	42	16	15	„	14.54	18.18	29.35	10.60			$1\frac{1}{4}$	$2\frac{1}{5\,6}$	„
	69	390	50	72	112	43	14	16	„	12.82	18.46	28.71	11.02			$1\frac{1\,3}{2\,5}$	$2\frac{9}{2\,5}$	„
	70	396	53	74	111	39	14	14	„	13.38	18.68	28 03	9.84			$1\frac{2\,3}{5\,3}$	$2\frac{5}{5\,3}$	„
	71	410	55	73	107	37	17	18	„	13.41	17.80	26.09	9.02			$1\frac{1\,8}{5\,5}$	$1\frac{5\,2}{5\,5}$	„
	72	416	56	83	112	39	16	18	„	13 33	17.38	28.09	10.47			$1\frac{1\,7}{5\,6}$	$2\frac{3}{5\,6}$	„
	73	420	56	73	118	44	15	19	„	13.46	19.92	26.92	9.32			$1\frac{2\,7}{5\,6}$	2—	„
	74	421	59	74	117	45	16	17	„	14.01	17.57	27.79	10 68			$1\frac{2\,5}{5\,9}$	$1\frac{5\,8}{5\,9}$	„
	75	496	68	93	140	39	16	18	„	13 70	18.75	28 24	10.60			$1\frac{2\,5}{6\,8}$	$2\frac{1}{17}$	„
Asahigawa, Mimasaku.	80	391	49	74	106	37	13	14	100	12.27	18 92	27.11	9 46			$1\frac{2\,3}{4\,9}$	$2\frac{3}{4\,6}$	*vulgaris.*
Lake Jinzai, Idsumo.	5	207	24	39	54	21.5	6.4	7	100	11.57	18.82	26.08	10.38			$1\frac{1\,5}{2\,4}$	$2\frac{1}{4}$	Between *bost.* & *vulg.*
	6	235	28	42	59	24	7	7	„	11.91	17.87	25.10	10.21			$1\frac{1}{2}$	$2\frac{3}{2\,8}$	*vulgaris.*
	7	256	30	43	68	26	6 5	8	„	11.71	16.79	26 56	10.19			$1\frac{1\,3}{3\,0}$	$2\frac{4}{1\,5}$	„
	8	298	33	55	77	28	8	10	„	11.07	18.45	25.83	9.39			$1\frac{1}{3}$	$2\frac{1}{3}$	*bostoniensis.*
	9	336	37	61	83	34	9	12	„	11.01	18.21	24.70	10.11			$1\frac{2\,4}{3\,7}$	$2\frac{9}{3\,7}$	Between *bost.* & *vulg.*
Shinju Lake, Idsumo.	10	421	54	76	120	44	14	20	100	12.80	18.05	28 50	10.45			$1\frac{1\,1}{3\,7}$	$2\frac{8}{3\,7}$	*vulgaris.*
	11	435	50	87	122	40	13	20	„	11.49	20.00	28.27	9.19			$1\frac{3\,7}{5\,0}$	$2\frac{1\,1}{2\,5}$	*bostoniensis.*
	12	445	56	80	121	44	12	23	„	12.58	17.97	27.19	14.51			$1\frac{2}{5\,6}$	$2\frac{9}{5\,6}$	*vulgaris.*
	13	451	54	90	128	47	14	17	„	11.97	19 95	28.38	10.42			$1\frac{2}{3}$	$2\frac{1\,0}{2\,7}$	*bostoniensis.*
Tottori Market, Hoki.	14	249	30	43	61	22	7	8	100	12.04	17.26	24.49	8.43			$1\frac{1\,3}{3\,0}$	$2\frac{1}{3\,0}$	*vulgaris.*
	15	268	34	44	70	25	9	9	„	12 68	16.41	26.11	9.32			$1\frac{5}{1\,7}$	$2\frac{1}{1\,7}$	„
	16	288	36	52	77	28	9.5	9.5	„	12.50	18 05	26 73	10 06			$1\frac{1}{9}$	$2\frac{5}{3\,6}$	„
	17	385	42	69	102	39	12	12.5	„	10.90	17 92	26 49	10 12			$1\frac{9}{1\,6}$	$2\frac{3}{7}$	Between *bost.* & *vulg.*
	18	399	52	68	105	48	14	18	„	13 03	17.04	26.31	12 03			$1\frac{8}{1\,3}$	$2\frac{1}{5\,8}$	*vulgaris.*
Sai-kawa, Kaga.	63	432	58	77	117	42	17	15	100	13.42	17.82	27.08	9 72			$1\frac{1\,0}{5\,8}$	$2\frac{1}{5\,8}$	*vulgaris.*
	64	437	56	85	122	42	17	17	„	12 81	19.45	27.91	9.61			$1\frac{2\,0}{5\,6}$	$2\frac{5}{2\,8}$	„
	65	455	65	93	122	33	20	20	„	14.28	20.43	26.81	7.25			$1\frac{2\,8}{6\,5}$	$2\frac{9}{3\,5}$	„
Ima-egata, Kaga.	76	450	57	75	117	44	18	17	100	12.66	16.66	26.00	9.77			$1\frac{6}{1\,0}$	$2\frac{1}{1\,0}$	*vulgaris.*
	77	502	58	90	142	55	16	18	„	11.11	17.90	28.28	10 95			$1\frac{1\,6}{5\,0}$	$2\frac{1\,3}{5\,0}$	Between *bost.* & *vulg.*
	78	526	58	107	140	46	17	19	„	11.02	18.44	26.66	8.74			$1\frac{4\,9}{5\,8}$	$2\frac{1\,3}{2\,9}$	*bostoniensis.*
	79	615	76	120	185	72	21	29	„	12.35	19 51	30.08	11.70			$1\frac{3\,7}{7\,6}$	$2\frac{3\,3}{7\,6}$	*vulgaris.*
Lake Biwa.	19	345	42	64	91	33	10	16	100	12.17	18.55	26.37	9.56			$1\frac{1\,1}{2\,4}$	$2\frac{5}{1\,4}$	*vulgaris.*
	20	350	42	66	97	36	10	17	„	12.00	18.85	27.71	10.28			$1\frac{4}{2\,7}$	$2\frac{1\,3}{4\,9}$	*bostoniensis.*
	21	357	43	67	97	33	12	14	„	12.07	18 76	27.17	9 24			$1\frac{2\,4}{4\,3}$	$2\frac{1\,1}{4\,3}$	*vulgaris.*
	22	359	41	74	97	27	10	12	„	11.42	20.61	27.01	7.52			$1\frac{3\,5}{4\,1}$	$2\frac{1\,5}{4\,1}$	Between *bost.* & *vulg.*
	23	368	43	71	104.5	39	10	18	„	11 70	19.29	28.39	10.50			$1\frac{2\,8}{4\,3}$	$2\frac{1\,8}{4\,3}$	„
	24	387	42	65	108	45	10	18	„	10.85	16.79	27 90	11.62			$1\frac{2\,3}{4\,2}$	$2\frac{4}{7}$	*bostoniensis.*
	25	398	48	70	102	38	11	19	„	12.06	17.58	25.63	9.54			$1\frac{1\,1}{2\,4}$	$2\frac{7}{2\,6}$	*vulgaris.*
	26	406	51	78	102	42	12	18	„	12.56	19.26	25.12	13.44			$1\frac{9}{1\,7}$	2—	„
	27	420	53	80	119	45	13	20	„	12.85	19.04	28.33	10.71			$1\frac{2\,7}{5\,3}$	$2\frac{1\,3}{5\,3}$	„
	28	425	53	80	111	44	13	22.5	„	12 47	18.82	26.11	10 35			$1\frac{2\,5}{5\,3}$	$2\frac{5}{5\,3}$	„
Tokyo.	60	215	25	37	56	20	7	7	100	11.62	17.11	26.01	9.30			$1\frac{1\,2}{2\,5}$	$2\frac{6}{2\,5}$	*vulgaris.*
	61	265	33	45	70	28	9	9	„	12.45	16 98	26.41	10.56			$1\frac{4}{1\,1}$	$2\frac{4}{3\,3}$	„
	62	362	47	62	102	43	12	14	„	12.95	17.12	28.17	11.87			$1\frac{1\,5}{4\,7}$	$2\frac{9}{4\,7}$	„
Hirobuchi Pond.	29	204	25	33	51	28	7	7	100	11.25	16.17	25.00	13.72			$1\frac{8}{2\,5}$	$2\frac{1}{2\,5}$	*vulgaris.*
	30	210	25	39	55	20	5	7	„	11.90	18.57	26.19	9 52			$1\frac{1\,4}{2\,5}$	$2\frac{1}{5}$	„
	31	229	29	39	62	23	8	8	„	12 66	17 03	27 07	10.43			$1\frac{1\,0}{2\,9}$	$2\frac{4}{5\,0}$	„
	32	237	27	43	65	22	7	7	„	11.39	18.14	27.42	9.25			$1\frac{1\,2}{2\,7}$	$2\frac{1\,1}{2\,7}$	„
	33	237	28	47	64	18	7.5	8	„	11 81	19.82	27.00	7.59			$1\frac{1\,0}{2\,8}$	$2\frac{2}{7}$	*bostoniensis.*
	34	238	29	39	62	26	8	8	„	12.18	16.38	26.05	10.92			$1\frac{1}{2\,0}$	$2\frac{4}{2\,9}$	*vulgaris.*
	35	247	30	45	66	22	8	8	„	12.14	18.21	26.72	8 90			$1\frac{2}{5}$	$2\frac{1}{5}$	„
	36	265	33	41	68	25	8.5	10	„	12.45	15.47	25.66	9.35			$1\frac{8}{3\,3}$	$2\frac{2}{3\,3}$	„
	37	266	30	43	74	27	8	9	„	11.27	16.16	27.81	10.15			$1\frac{1\,3}{3\,3}$	$2\frac{7}{1\,5}$	„
	38	275	32	44	71	25	9.5	9.5	„	11.64	16.00	25.81	9.99			$1\frac{2}{3\,2}$	$2\frac{5}{3\,2}$	„
	39	277	36	47	73	26	9	10	„	12.99	16.93	26.35	9.89			$1\frac{1\,7}{3\,6}$	$2\frac{1}{3\,6}$	„
	40	285	36	52	81	29	10	11	„	12.63	18.17	28.42	10.17			$1\frac{8}{1\,0}$	$2\frac{1}{8}$	„
	41	335	37	62	89	32	10	12	„	11.04	18.47	26.56	9.55			$1\frac{1\,5}{3\,7}$	$2\frac{1\,6}{3\,7}$	„
	42	345	43	64	92	36	11	12	„	12.46	18.55	26.66	10.43			$1\frac{2\,1}{4\,3}$	$2\frac{6}{4\,3}$	„
	43	345	46	64	94	34	14	13	„	13.33	18.55	27.27	9.85			$1\frac{9}{2\,3}$	$2\frac{1}{2\,3}$	„
	44	362	40	56	93	42	11	14	„	11.04	15.46	25.69	11.93			$1\frac{2}{9}$	$2\frac{1\,3}{4\,0}$	„
Shinai Pond.	45	297	37	54	85	34	10	10	100	12.45	18.18	28.61	11.44			$1\frac{1\,7}{3\,7}$	$2\frac{1\,1}{3\,7}$	*vulgaris.*
	46	374	48	72	105	46	12	15	„	12 83	19.23	28.15	12.29			$1\frac{1}{2}$	$2\frac{9}{6\,8}$	„
	47	387	46	72	103	38	13	15	„	11.88	18.60	26.09	9.81			$1\frac{1\,3}{2\,3}$	$2\frac{1\,1}{4\,0}$	„
	48	395	49	74	113	46	14	15	„	12.40	18.73	28.60	11.67			$1\frac{2\,6}{4\,0}$	$2\frac{1\,5}{4\,9}$	„
	49	397	51	69	119	39	14	17	„	12.84	17.38	29.97	9.82			$1\frac{1\,6}{5\,1}$	$2\frac{1}{3}$	„
Kogawara Pond.	50	281	39	52	78	29	9	10	100	10.32	18.50	27.75	10.32			$1\frac{1}{8}$	2—	*vulgaris.*
	51	312	35	56	80	26	9	10	„	11.21	17.94	25.67	8.32			$1\frac{3}{8}$	$2\frac{2}{7}$	Between *bost.* & *vulg.*
	52	317	35	60	89	30	9	10	„	11.04	18.89	28.04	9.46			$2\frac{5}{7}$	$2\frac{1\,9}{3\,5}$	*bostoniensis.*
	53	335	38	59	85	31	9	11	„	11.34	17.61	25.37	9.16			$1\frac{1\,1}{3\,8}$	$2\frac{9}{3\,8}$	*vulgaris.*
	54	345	39	65	90	31	10	13.5	„	11.30	18.84	26.08	8.98			$1\frac{2\,0}{3\,0}$	$2\frac{4}{1\,3}$	*bostoniensis.*
	55	350	41	65	90	32	11	12	„	11.14	18.57	25.71	9.14			$1\frac{2\,4}{4\,1}$	$2\frac{6}{4\,1}$	Between *bost.* & *vulg.*
	56	360	41	70	101	33	12	13	„	11.38	19.44	28.05	9.11			$1\frac{2\,9}{4\,1}$	$2\frac{1\,2}{4\,1}$	*bostoniensis.*
	57	360	44	64	98	38	11	11	„	12.22	17.77	27.22	10.55			$1\frac{5}{1\,1}$	$2\frac{5}{2\,2}$	*vulgaris.*
	58	366	41	63	99	39	10.5	12	„	11.20	17.21	27.04	10.65			$1\frac{2\,3}{4\,1}$	$2\frac{1\,7}{4\,1}$	„
	59	378	50	71	105	36	15	15	„	13.22	18.78	27.77	9.63			$1\frac{2\,1}{5\,0}$	$2\frac{1}{1\,0}$	„
Hidaka.	1	389	48	80	113	36	13	14 5	100	12.34	25.65	29.07	9 23			$1\frac{2}{3}$	$2\frac{1\,7}{4\,8}$	Between *bost.* & *vulg.*
	2	470	54	83	128	52	14	17	„	11.70	17.06	20.72	10.09			$1\frac{2\,9}{3\,7}$	$2\frac{1\,0}{3\,7}$	*vulgaris.*
	3	494	57	97	137	45	15	16	„	11.54	19.63	27.93	9.19			$1\frac{4\,0}{5\,7}$	$2\frac{2\,3}{5\,7}$	*bostoniensis.*
	4	525	64	100	145	53	16	19	„	12.19	19.04	27.61	10.12			$1\frac{7}{8}$	$2\frac{1\,7}{6\,4}$	„

Note.—T.L = Total Length; Head = the Distance between the tip of the lower jaw and the upper edge of the gill-opening; G.O. = Gill Opening; D. = the origin of the Dorsal Fin; V. = Vent.; A. = the origin of the Anal Fin; C.M. = the Cleft of the Mouth, taken from the extremity of the tower jaw to the angle of the mouth; P. = the length of the Pectoral Fin.

ON THE VARIATIONS OF THE PROPORTIONAL LENGTHS OF THE HEAD, etc. AS TO THE TOTAL LENGTH IN OUR OMMON EEL.

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Some years ago while looking over the collection of eels from Lake Biwa, it struck me that the amount of variations occurring among the individuals taken from one and the same locality is very great, a fact which induced me to conclude that the two species of eels—*Ang. vulgaris* and *bostoniensis* might simply be varieties of a single species.*

As I made these observations I was quite ignorant of similar and more extended observations of M. C. Dareste† who came to the same conclusion long before me, and it may therefore of be no use to beat over the same ground again. But in order to see the exact amount of variations occurring among the specimens taken from different parts of our Island, and to determine whether the two varieties are peculiar to certain localities, the following measurements were made :—

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* C. ISHIKAWA: A Preliminary Note on the Fishes of Lake Biwa, Zool. Magazine Vol. II. No. 82. 1895.

† Comptes-rendus of the Academy of Sciences, Paris.

From these measurements it will be seen that all the specimens from Tokushima in the Island of Shikoku, are of the *vulgaris* type. The same is the case with a single specimen taken in the river Asahi in Mimasaku, while coming over to the northern side of the mountain range, we find among 5 specimens from the Lake Jinzai, Idsumo, 1 *bostoniensis*, 2 doubtful specir standing between the two, and 2 *vulgaris*. A similar state of things appears to occur in Lake Shinju, a little way east of Jinzai. Here among four specimens, two are of the type *bostoniensis* and the other two of *vulgaris*. Further east in Tottori, Hoki, the *bostoniensis* type appears, to become less. Of the five specimens taken in the vicinity of the town, one only proved to lie between the two varieties, while the four others were of the *vulgaris*. In Saikawa, Imaegata, in the Province of Kaga, and in Lake Biwa, all lying further east from Tottori, we still find some *bostoniensis*. The *vulgaris* type appears, however, to preponderate more and more, and in Tokyo, judging from only three specimens kept in the museum, we find more *vulgaris* than *bostoniensis*. The same appears to be the case with the specimens collected north of Tokyo. Of 21 specimens from Lakes Hirobuchi and Shinai, both lying very near to each other, only 1 *bostoniensis* was found, while all the others proved to be *vulgaris*. But further north in Lake Kogawara in Rikuoku the *bostoniensis* appears to become more mumerous; 3 out of the 10 specimens taken from that lake being *bostoniensis* while two stand between the two varieties. Lastly the specimens from Hidaka in Hokkaido, show more *bostoniensis* than *vulgaris*.

The above tables are of course made from too few specimens to draw any conclusion as to the distribution of the two types of *Anguilla* in our country. It seems, however, that the type *bostoniensis* occurs more in the south-western and in the northern provinces, while in the central portion, *vulgaris* is the predominent type.

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